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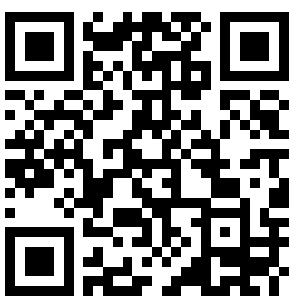

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SOUND WAVES

VOLUME XIV
No. 1

INTERNATIONAL TELEPHONE JOURNAL

JUNE
1907

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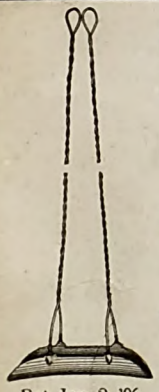
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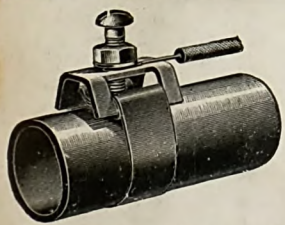

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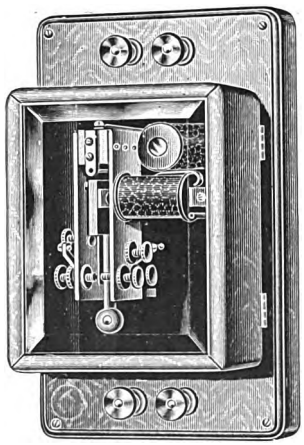

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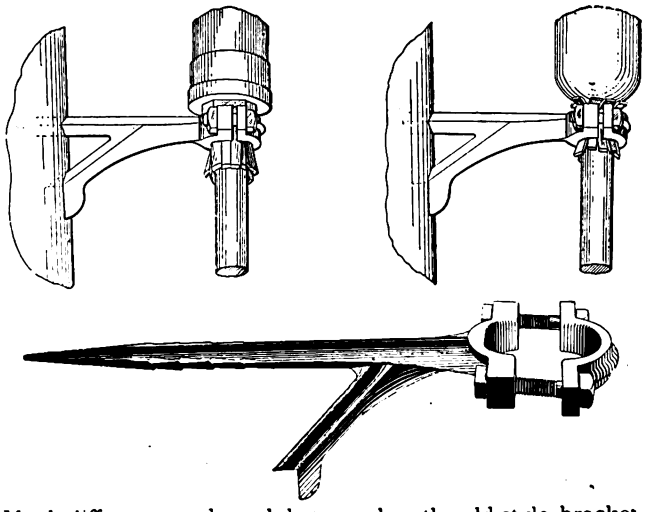

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SOUND WAVES

An Advocate of Independent Telephony

VOL. XIV CHICAGO, JUNE 15, 1907 No. 1

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CHICAGO, JUNE 15, 1907.

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THE BIG ANNUAL CONVENTION.

THE get-together spirit of the International convention was the most pleasant feature of it. There is no need to say it was a convention of achievement, because everybody who attended knows it. But it differed greatly from any other International convention of Independent telephonists. It does not require a master-mind to recall the old slogan of cheaper rates. That argument has passed away. The old method of meeting Bell competition was the universal adoption of the cut rate. The old plan meant to deliver cheaper service and it did. It had many favorable advantages that worked out satisfactorily to everybody. It made possible the use of a telephone in places where an instrument might never been known. The public was satisfied; the operator was contented, and the manufacturer and supply dealer was pleased—it meant future orders! There was very little complaint. With increased prosperity, and the knowledge which the use of a telephone develops, the public has become discriminating. What the subscriber once thought was a luxury at any price has now become his most valuable necessity. He has also learned that good service is cheap at any reasonable price.

That other old reason, the reduction of rates brought about by competition in some cities made it possible for the subscriber to pay rentals for two telephones and still not pay as much as he formerly paid for one, has been forsaken. No part of the proceedings of the recent convention touched it.

It was only a little while ago that the Bell Company tried to oppose all competing Independent companies by reducing the schedule of prices. In certain cities this practice of the Bell monopoly went so far as to offer free telephone service in order to stifle competition. The Independents have survived this method of attack, and although many of the operating companies had a bitter struggle, all seem to have emerged successfully from the battle, and the Bell has been forced to turn its attention to other methods. Still more recently the Bell Company has endeavored to disparage competition by casting aspersions upon the kind of apparatus used by Independents. This effort was very short-lived, because it is well known that Independent telephone apparatus is superior to Bell, and that the improvement in the Independent apparatus far exceeds the Bell product. Bell apparatus is the product of the Western Electric Company and this product is manufactured to conform with patents and specifications which have been in use for years. Any slight change in the detail would mean the confiscation of millions of dollars' worth of property already in use. While not officially recognizing it, consensus of the convention sentiment would seem to give the Bell Company

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credit for the improvement of its long distance service. It is very easily apparent that the monopoly realized that the public would be willing to pay for the best possible long distance service. It is notably true that the company gives better long distance service than it does local service. The Chicago business man can talk with greater satisfaction to his party in Milwaukee than he can across the hall in his office building. It is very satisfying that the Independents fully realize the business interests of the country demand the best service it is possible to render in preference to any other kind of service, and it is also very comforting to know that their efforts toward the production of this service are making satisfactory progress.

* * *

Notwithstanding the prevailing high price of copper, many of the Independent long distance companies are seeking to increase their earnings, not only by the establishment of long distance lines, but by leasing them to telegraph companies for the transmission of telegrams. A careful canvass among leading operators also disclosed a general awakening on the subject of measured service. Many of the larger Independent companies are now facing this problem and are taking steps to change their rate schedules, where possible, from flat to measured basis. In a large telephone system offering wide diversity in its class of service, there is little doubt that measured rates are not proper to govern a portion of it. In the smaller towns where the number of calls per subscriber is fairly uniform, the flat rate will continue to prevail. On the part of those companies which made the mistake of starting with a low rate in the beginning, there is a marked tendency to raise the rates. Unfortunately Independent telephone men are not prophets. The enormous extension of their systems have exceeded their early expectations. It costs proportionately more to operate a large plant than it does a small one. The rate should be raised. Many of the large Independent companies throughout the United States have passed through this troublesome reconstruction rate period without the loss of any considerable number of patrons, and in the face of lively competition with its opponent. Independent companies should not hesitate to advance their rates whenever they are justified in doing so, because people of any community are willing to pay whatever is right for good service. Necessarily, the public will have to be educated by being brought to a realization of the condition which makes rate raising vital.

* * *

The exhibits of a convention always bring out the new devices of the manufacturer. Many new things were shown this year. These convention exhibits offer an interesting study and many operators take advantage of the annual exhibits to post themselves and be ready to adopt those important appliances which will be of most benefit to the company and to the patrons. The most noticeable improvement to be found this year seemed to be the development of the harmonic systems for party-line ringing. In communities where good ground conditions exist there can be no objection to the present ringing systems, but where such obstacles as sandy soil, rocks and gravel abound, it is sometimes difficult to use any other than a metallic ringing system. Where potential differences are caused by a season of dry weather, or during the frozen winter months, or are interfered with by electric railway systems using ground returns the comparatively new harmonic systems have decided advantages over present ringing methods.

These latter conditions are more noticeable in the larger cities than in the smaller towns and villages and have made the problem of grounded ringing a very serious one. For example, in New York City, little difficulty is experienced in operating the ordinary selective ringing of telephone bells, because all of the trolley lines are using an underground circuit with an insulated return. Such a system, being entirely independent of the ground, causes no difference in potentials between the subscribers' telephone instruments and the exchange, consequently there is no trouble due to earth potentials. In Chicago, on the other hand, all of the trolley lines are supplied by overhead conductors and depend upon bounded rails and the earth for the return of the current to the power house. The soil is generally bad from an electrical standpoint, causing large differences in potential throughout various portions of the city.

It is for these reasons that Independent manufacturers have long sought to produce selective ringing systems that would be independent of ground returns. Obviously the solution of this problem requires a system of metallic ringing.

* * *

A great improvement was to be found among the exhibits of coin registry devices. The increasing demand for these machines results from the adoption of measured rate schedules among the larger Independent operating companies. There seems to be a growing demand for a register which can be operated by the subscriber at his instrument without the use of a ground return to the central office. The larger operating companies locate the meter at the central office, instead of placing it at the subscriber's instrument, because no suitable device has yet been designed which will accurately register at the end of the line without proving something of a drag upon the operator's service.

* * *

Considerable attention was directed to a copper plated steel wire exhibit made by the Duplex Metals Company. For many years inventors have tried to find a process for copper plating steel wire. Until recently, all such steps have resulted in an imperfect weld between the copper and the steel. It has been found that such wire will mechanically separate, allowing the two metals to slip over each other. A process has at last been discovered which makes a complete weld between the two metals and many samples were exhibited showing the perfect nature of the weld during the process of drawing the wire down to different sizes. Samples of No. 38 wire having a diameter of only three one-thousandths of an inch were exhibited in which the weld seemed to be perfect. This wire will undoubtedly be a great boon to the telephone interests of the country, for it offers a combination of conductivity and tensile strength that is almost ideal.

* * *

The selective lock-out played a new and surprising role. Every convention has seen the appearance of several of these systems and the succeeding conventions have again seen their disappearance. The history of the lock-out system has been an interesting one. Several years ago certain manufacturers attempted to place systems on the market which were designed for use in the rural districts. At that time, as there is today, there was a decided demand for a successful system and many telephone operators took chances with apparatus which had not been carefully worked out and tried in the field. The result was that most of these earlier systems, like all other innovations, proved disastrous both to the manufacturer and the operator. The systems could not or would not work satisfactorily and much to the annoyance of the subscriber the instruments became wholly

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inoperative at just the times they were most needed.

Many operators were compelled to abandon all thought of using the much desired lock-out principle on account of the failure of the apparatus to work. Meanwhile, other systems have been invented and put into operation, systems in which the mistakes of the earlier inventors were carefully guarded against. Many of these have also gone into the paths of their predecessors and with each of them there has been developed an ever increasing prejudice on the part of the operator.

The exhibits of selective lock-out apparatus at the convention attracted much attention especially among those operators who have had experience with prior systems and still have use for a good one. There were some notably good systems in operations which responded favorably to every test made upon them. It is clearly evident that there is a large and growing demand for such apparatus.

* * *

Cable splicing apparatus came in for its share of attention among cable men. It was demonstrated that some kinds of splicing can be economically done by machinery, but it is practically impossible to build a machine which will eventually replace the man who has to work in all sorts of conceivable positions and under the most difficult circumstances.

The tendency of the Independent operators to make use of by-products was clearly illustrated in the exhibits of fire and burglar apparatus. The exhibits of clock service were also suggestive of methods of increasing revenues.

Commerce in Copper.

A curious feature of our foreign commerce is found in the fact that although the United States produces one-half of the world's copper and exports far more than any other country, it is also one of the largest importers of that commodity. The value of copper imported into the United States in 1906 was over $37,000,000, including in this total $6,750,000 worth of copper ore, while we were at the same time exporting over $90,000,000 worth of that metal, including in this sum a little less than $2,000,000 of copper ore, of copper ingots nearly $85,000,000, and of other copper manufactures between $4,000,000 and $5,000,000.

This anomaly of the greatest copper producing country of the world importing such large quantities of copper grows, apparently, out of the fact that the United States has superior smelting and refining facilities and that the copper from its immediate neighbors at the north and south—Canada and Mexico—is drawn to its smelting establishments and refineries.

A considerable part of the pig copper imported is brought in for the purpose of extracting the precious metals which it contains, and a part of this comes from European countries. How much of the $37,000,000 of copper imported is re-exported under the title of American copper cannot be determined, as any imported article, which has undergone a further process of manufacturing after entering the United States, is when exported, reported to the bureau of statistics as a domestic manufacture.

WIRELESS TELEPHONY.

THE Paris *Matin* reports that a French savant, Maiche by name, has succeeded in constructing a wireless telephone. In his laboratory at St. Germain he exhibited his apparatus in its most recent form, which consists of ordinary telephone apparatus connected with an electric battery of three elements, and a special induction apparatus designed by the inventor. The electric current circulates in a frame consisting of a web of insulated conducting threads. A similar installation is made in the place where the message is to be received. The experiment was made at a distance of forty metres, several walls separating the two instruments. The voice sounded feeble and distant, but distinct, with no accompanying confusion of sounds. It is said that Maiche worked five years on his invention, now made public, and that he was assisted in his experiments, pecuniarily, by the Prince of Monaco, who had a laboratory arranged for him in his castle of Marais.

This French physicist, who is known for other achievements in electrical science, as well as for his work in the sterilizing of water, used the earth at first for a conducting medium in his experiments in wireless telephoning. He succeeded in carrying the sound to a distance of 300 kilometres. Still better results attended his attempt to transmit the electric waves through the water of the sea. He made a connection in this way between Toulon and Ajaccio. He thinks that the first practical application of his invention, in its present stage, will be the possibility of telephone connection with submarine boats. Where the air must be used as a medium the invention will need further perfecting for long distances.

EXIT PRESIDENT FISH.

IT is announced that Frederick P. Fish, erstwhile president of the American Telephone & Telegraph Company, resigned his high post at a special meeting of the board of directors of his company. This, in itself, would suggest something out of the ordinary, because it is not usual for men of mature years to relinquish executive places with a salary attachment running into six figures.

Mr. Fish offered for excuse that he had been awaiting a favorable opportunity to let go in order that he might resume the practice of law. The opportunity came when he could find an available man as his successor, but he was not obliged to look beyond his own directorate to find this man, and from the legal profession we had heard of no extraordinary clamor for Mr. Fish's personality. Clearly there was another reason which Mr. Fish's modesty has prevented him from stating.

Independent telephone men, with commendable unanimity, believe that the former head of the telephone monopoly was unable to prolong his policy and finance the company. Mr. Fish had an utter disregard for legitimate telephone competition. His contempt for Independent was frequently expressed and when he did not give voice to his personal opinions we constantly were reminded of them through his subordinates. It was only a little while ago when the Fish sentiment broke forth through Judge Herrick, a Bell attorney, who said in referring to Independent operators: "Their organization and operation amounts to practical blackmail."

The tremendous strength of Independent operators has become known to the same interests which Mr. Fish represented. The requirements made upon the Bell Company are not unlike those which prevail among Independents. The cry for telephone service affects all telephone operators alike. Because more and more money is needed to make the extensions demanded to serve the public should not in any manner affect telephone earnings or securities.

The Fish method of warfare diverted funds which should have gone into needed improvements. These funds were used to quash by unfair means an industry which was playing havoc with his company.

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Mr. Fish has been succeeded by Theodore N. Vail, who began life as a poor boy and became a telegraph operator in his youth. By easy stages he became interested in the telephone business. Upon his election to the presidency of the Bell Company he is quoted as having said:

You may state unqualifiedly that no interest has had a hand in the change of head except the directors of the company. Nearly all the heads of departments in Boston have been with the company since its early days and I come back to it, as it were, with the old organization.

Ex-president Hoge of the International Association, referring to the resignation of Mr. Fish, has said:

I think that while Mr. Fish may have been due to retirement, his passing has some significance as to the changed tactics of the Bell people. They have evidently abandoned the ruinous competitive policy, and to my mind both the Independents and the Bell will profit thereby. There has undoubtedly been a great change going on in the inner councils of the Bell, and I think we have seen the end of the rate cutting policy designed to squelch the Independent movement. It will be better for everyone engaged in the telephone business.

Let us hope that Mr. Hoge's prophetic optimism may be fully realized.

ADVANTAGES OF TECHNICAL TRAINING.

WE have often heard men past middle age express their regret at not having obtained a college education, saying that much of the best in life had been missed because of the lack. Coupled with it, they often make the statement that their sons shall not go without this necessary part of life's equipment. The opinion of men who have been through much of the experience of life is well worth any young man's attention, for it is not necessary for all of us to make the same mistakes over and over. As we follow our fathers, it is our privilege to see the mistakes which they made and avoid them. This is one of the surest ways to honor them, making their failures the stepping stones in the advancement of the race.

In no department of life's activities is this any truer than in the telephone business. Many young men are ambitious and wish to get along well in the world, and if they are telephone men they desire to be able to handle anything which comes up. This is a laudable ambition, and should be encouraged by every means. There is no need of a man sitting down in one place and saying to himself that it is no use to try to lift himself to a better position. The world is full of good opportunities for any man who will work. Work to prepare himself in ability, and work to fill the position with credit when he gets it. There is every sympathy and help for the man who works, but finds it hard to learn. There is no time for the man who will not try.

If a man wishes merely to fill a minor position, not caring to rise to a place of high responsibility, he might omit a special training in the theories and laws underlying the business. There are men who do not think themselves equipped with enough native ability to hold successfully any but an inferior place. Possibily nothing can be done with such men, though they would be benefited by an honest, earnest effort, even if they failed to accomplish very much. But it is to the young man with ambition that we wish to talk. If you have started into the telephone business from the practical end, you have doubtless come across many things that puzzle you. You have asked for explanations from others, and sometimes the answers were clear and sometimes they were unsatisfactory. Often they may be correct in a way, but do not go to the root of the matter, leaving you with an imperfect conception of the reasons for the action in question. If you have the ambition to *master* the telephone business, or some part of it, you ought not to be satisfied with anything less than a thorough, clear-cut, and perfect understanding of all the principles involved in your work. There may be actions whose laws have not yet been discovered, but you ought to get all that there is to be had. If you were learning to run a locomotive or an automobile you would not be satisfied to know that this lever works the brake, that lever makes the machine start, and the other makes it go back. You would want to know *how* each part works, and *why*. It is even more so with the telephone. The complication of telephone apparatus is increasing daily. It is not the simple thing that it was ten years ago. The first common battery switchboards were thought to be very intricate. Now comes the automatic which has the common battery manual put to shame for complexity. Yet the common battery manual has come to stay, and the automatic has come to stay. It is for us to polish up our minds and meet the changed conditions. When the first telephones came around, the telegraph man was pressed into service and became the telephone man in many cases. But with the growth of the common battery system, many of the old magneto men did not take kindly to the innovation and fell out of the race. The young men are the ones who most quickly catch the new idea and come to the front. And the conditions are changing again. If the men who displaced the older men do not adapt themselves to the times they too will be replaced by younger men who know and understand the systems now coming into use.

In view of these things, no telephone man with ambition can afford to neglect any opportunity for learning. And mere isolated facts are not enough. He must know the underlying laws and have a broad view of them. Then he will be able to apply himself to the new things which come up with the assurance that he can master them. Begin the work right by getting a technical education, one that is broad enough to make you fit for the best positions. Many people desire the best positions as well as you, but not all are willing to pay the price of preparation.

SERVICE VS. SENTIMENT.

SENTIMENT has rightfully been responsible for much of the success of Independent telephony in the past. It will have some part in promoting new enterprises in the future, but it must be conceded that its best days of usefulness have been relegated. The shrewd operator has realized for a long time that his success depended upon the service he was able to render to his subscribers. He may have talked sentiment, but he gave to his patrons good service. W. B. Scruggs in his address before the Missouri convention may claim the credit for launching the new watchword. Colonel Hackett added emphasis to it at Springfield. Since then the topic of service has been very prominent in the discussions of operators assembled at conventions.

The matter of sentiment is nowhere in evidence in the convention papers we have heard and read. To be able to give good telephone service and satisfy the demands of the average investor in telephone securties, requires a managerial genius. He must maintain his equipment, anticipate the growth, extend the system, provide for more help and pay dividends. Sentiment can have very little to do with any of these things where competition is rife. Service will have all to do with it.

In spite of the opposition to Independent development, we are all agreed that the business is going forward by leaps and bounds and that its greatest success lies in our ability to give the public what it demands from us.

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The International Convention

THE annual convention of the International Independent Telephone Association was called to order at 2:30 p. m., Tuesday, June 4, at the Auditorium Hotel, Chicago, with the president, Mr. James B. Hoge, in the chair.

THE CHAIR: The 1907 convention of the International Independent Telephone Association will now come to order, please. We have with us this afternoon Dr. Evans, the Commissioner of Health of the City of Chicago, who is here representing the administration for the purpose of delivering to us the address of welcome. I now have the pleasure, gentlemen, of introducing Dr. Evans.

DR. W. A. EVANS: Mr. President, Ladies and Gentlemen: There is sometimes said to be significance in the selection of the representative of the city government to welcome bodies to the city of Chicago. It has been said that at times the body welcomed was so hilarious that nothing less was required than that they should be turned over at once to the Police Department. I want to assure you, in sending me here, that the Mayor of Chicago desired to refrain from any such reflection as that. It has been said in certain quarters that there were some bodies that met in the city that made things so warm that nothing was more appropriate than that they should be welcomed by the Chief of the Fire Department. There is no particular significance in the selection of the Chief of the Health Department to welcome you to the city of Chicago.

I regret, I am sure, more than you do, that you are not to be welcomed by the Mayor himself. The circumstances are such that it is not possible for him to be here this afternoon, and I stand in his stead, and he is in the shoes of the citizens of this city, extending to you a welcome during the period of your convention here.

I am told that the business interests represented stand for something over one hundred millions of dollars; I believe three hundred millions of dollars; there are four millions of subscribers to your telephones, and that you are the representatives of that great organized energy which, within a life time, has builded this middle west from a region uninhabited into a great hive of activity. In that movement that in America takes the raw material, entirely unworked, and within the space of a generation converts it into great machinery for the doing of great things, there is no city that ranks with the city that is your host here today. And, therefore, there is a certain appropriateness in the meeting here of this organization, which, taking an industry unknown a quarter of a century ago and creating practically something out of nothing, has made of the telephone a great civilizing and utilitarian force. Therefore there is something of reciprocity in your organization, standing for what you do, meeting in this city, which stands for that which we represent.

Gentlemen, in behalf of the Mayor of the city of Chicago, and through him in behalf of the citizens of this city, we welcome you, wishing Godspeed to your deliberations, and not altogether forgetfulness of the pleasant side of meetings such as this.

THE CHAIR: The next speaker this afternoon is Mr. John M. Glenn, Secretary of the Illinois Manufacturers' Association, an organization that has been very deeply interested in the telephone movement for some years and has been doing everything in its power, apparently, to get proper terminal facilities for our Independent telephone interests in this city, looking upon it as an essential in order to better Chicago's condition. I now have the pleasure, gentlemen, of introducing Mr. John M. Glenn.

MR. GLENN: Mr. President, I am also here as a substitute, this afternoon. Captain Smith, the president of our association, was called out of town this morning, and I came down to tell you that we welcome you here on behalf of the business interests; that we are in sympathy with your movement; and that we want to get connection with your exchanges. The Manufacturers' Association represents the manufacturing interests of Illinois; a large number of our members are here in Chicago, and all the members of the association outside of Chicago are in sympathy with your movement and want to get in touch with your exchanges. The business of Chicago, which amounts to a billion, five hundred million dollars, is now dependent on the Bell monopoly. The Manufacturers' Association started out seven years ago to fight this monopoly and to try and get for its members a better service at a lower rate. The telephone company at that time was exceeding the legal rate provided for in its ordinance. We went along till there did not seem anything else for us to do but to organize a telephone company. We organized a company, and have gone to the council and demanded of the council that they give the Manufacturers' Association an ordinance. We call our company the Manufacturers' Telephone Company, and have been persistently endeavoring with the council committee on Gas, Oil and Electric Light, to get an ordinance reported. I want to tell you, gentlemen, that the Committee on Gas, Oil and Electric Light of the city of Chicago, which has practically refused to give you gentlemen connection, does not represent the business interests of this city. We want all the business we can get, and we believe in having as free an interchange of telephone business as possible. We believe that you are entitled to entrance into this city. We do not believe it is good business to keep you out, and the business interests of Chicago want you in.

Theo. Gary.

I do not know that there is anything more that I can say, except that we are glad to have you here, and that we think that your coming here at this time is very opportune for us. The ordinances are pending before the committee. The Chicago Telephone Company's ordinance has been tentatively agreed upon, and there is no provision in it for any connection with any of your exchanges. When that matter came up, the Chicago Telephone Company did all it possibly could to show to the committee that this outside business did not amount to anything, that you gentlemen did not have good equipment, that they could not maintain a conversation over you telephones in connection with the Chicago Telephone Company's equipment and wires, because your equipment was inferior. Now every one knows that so far as telephoning is concerned your exchanges are run as well and with as good instruments as the Bell Telephone Company's instruments; that the Western Electric Company hasn't any monopoly in making a good machine.

On behalf of the business interests, and on behalf of the members of the Manufacturers' Association and the Manufacturers' Telephone Company, we extend to you a hearty welcome.

THE CHAIR: Gentlemen, the next speaker who will address you this afternoon is a gentleman that really needs no introduction, because I do not believe that there has been a convention of Independent telephone interests of a national character held since the first one was held ten years ago in Detroit, that this gentleman has not been present.

It is my pleasure this afternoon to introduce to you this gentleman, and immediately after he gets through with his address, the official photographer will take a picture of the convention. So I want you all to stay and to permit this picture to be taken at that time, so that we can get through with that and go ahead with the balance of the program.

I now have the pleasure, gentlemen, of introducing to you Mr. H. D. Critchfield, of Milwaukee.

MR. CRITCHFIELD: Mr. Chairman and Gentlemen of the Convention, Dr. Evans, Mr. Glenn: Dr. Evans, we particularly appreciate that portion of your welcome—and by that I do not mean to say that we do not appreciate it all—that portion which recognizes the fact that the Independent telephone people do not come to conventions to paint the town red. It might have been held in Chicago during the months of April and May; it has been cold here. But it is turning warmer, and conforming to the natural conditions of the weather, as well as of the public demand for telephone service, we are met here to do those things which it is practicable for us to do on an occasion of this kind for the furtherance of our business. We are glad to know, Dr. Evans, that Chicago has awakened to the magnitude of the Independent telephone business, and we bespeak from your administration that which we believe will be given, a fair, full and impartial consideration of the application of the Manufacturers' Telephone Company for a franchise.

James B. Hoge.

And you, Mr. Glenn, we sympathize with you. We are with you. We want you to succeed. We sympathize with you, because we have been through just this sort of thing—never, perhaps, on so large a scale as you have here. We sympathize with you for that reason. We sympathize with you because we want an Independent telephone system in Chicago for our selfish ends as well. We sympathize with you, further, because we want to see Chicago the metropolis, if not of the country, as I think it is, certainly of the middle west, that territory which gave birth to the Independent telephone business—equipped with facilities that will enable the people who are naturally tributary to her wonderful markets and resources to communicate and interchange business with her in the manner in which they should be permitted to do.

And, saying this, it is perhaps well and fit that I should say to you a little more about who we are and what we are.

The Independent movement started in 1895. By that I mean that there were not 5,000 non-Bell telephones in the United States prior to the first of January, 1895. Since that time, from nothing, as you, Dr. Evans, have said, from nothing but the raw material and a desire to have it manufactured into telephone service, the Independent telephone men from every walk of life, beginning as a side issue in the first instance, have built, equipped and now operate four millions of telephones in the United States. Without speaking harshly or unkindly—and yet I have no occasion to speak otherwise—of our competitor, I want to say that in the thirty years since the telephone has been a commercial proposition, the Bell Telephone Company, so called, and affiliated organizations, have installed and now operate in the United States three millions of telephones; that in 1895, when the Independent movement started, there were in the United States 325,000 telephones, after eighteen years of development under one system, the monopoly. Since that time, under the spur of competition largely, the Bell telephone interests have increased to three millions and the Independents have built alone four millions of telephones and operate them.

I want to say, further, that the general proposition with which every municipality is confronted when an application for a so-called competition telephone system is made, is that the installation of a second system is a wonderful duplication and a burden upon the community. That is not a fact. A canvass of the directories of eight of the largest cities in the country in which there are two telephone systems shows a duplicate use of twelve per cent. That is, twelve out of each 100 of the telephone users have two telephones, and eighty-eight out of each 100 have one telephone, and in the smaller communities and the rural districts the percentage of duplications is substantially nothing. We estimate the percentage of duplication throughout the country is less than seven per cent. All the interests combined, Independent and Bell, have been absolutely unable to raise the money to build the lines, to install the telephones that the public demanded. We fill a field that is not filled and never has been, and perhaps never would be, by any interest except the Independent telephone. It is a commercial, business proposition. It is a fact that the Bell telephone interests have been and are financed almost exclusively in the New England states and New York City. It is a further fact that the Independent telephone interests are financed almost exclusively in the communities in which they operate. Neither field contributing substantially to the other; each working in a different field; each influencing financial interests in different communities, under different conditions, that but for the peculiar influences either of the interests would not become interested in the business.

The greatest growth in the history of the Independent telephone—and there is in use today one telephone for each thirteen people—approximately—has been within the past year, the year 1906. The demand is not supplied, is growing continuously and all the time.

Now a word about Chicago. There are within 500 miles of Chicago 1,200,000 Independent telephones, whose users are deprived of connection over the Independent lines with your market centers. There are in that same territory fewer than 650,000 Bell telephones. Your whole telephone business within that territory from which you draw most largely is confined at this time to fewer than 650,000 Bell telephones, while you deprive the users of 1,200,000 telephones of the humble privilege of doing business with you. Is there any good reason why; is there any commercial reason why the city of Chicago should not permit the people who use those telephones to do business with you? You send trade excursions to South America, the Panama canal, and throughout this country to advertise and bring business to your city. Why not let the people who are begging for the privilege of doing business with you come in?

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There is no reason why you should not. No man has to take two telephones. He only takes the second telephone when it is to his financial advantage to do so. It is not forced upon a man. He takes it if he wants it, or he lets it alone. The result is that there will be approximately twice as many telephones in the city of Chicago as now upon the completion of the second exchange, and each exchange will grow larger. The prior occupant in other cities has grown, increased, multiplied, and the result has been not only more telephones in each exchange, but a lower rate and a better service, and more courteous treatment of the general public.

There is no good reason why, after satisfying itself that the Manufacturers' company means business and are able to make good the city of Chicago should not permit it to install a

H. D. Critchfield.

telephone system in Chicago and give to the people of Chicago who may so desire the opportunity to have a better and a cheaper telephone service, and, in addition to that, have access to this great volume of business throughout the middle west. That the Manufacturers' Association does mean business, I believe is evidenced by the fact that it has done that which no other utility company ever did, has offered to deposit five million dollars in cash as a forfeit to the city if a franchise be granted to it and it does not build. It seems to me that that is a sufficient evidence of good faith, when properly safeguarded and protected and you see you can get it. We want to come in here. We want to do business with you. We specially bespeak your most earnest and careful and full consideration of this proposition.

To you, Mr. Glenn, if we can help your association and those whom you represnt, we are ready to do it.

A photograph was then taken of the members of the convention.

THE CHAIR: Gentlemen, I will now deliver to you what will be my last annual address as president of your organization.

A voice: Who said so?

The president then read the following address:

You are to be congratulated upon being able to take part in the deliberation of what promises to be the greatest convention ever held by the Independent telephone interests at the close of the best year's work of its history. Your duties and responsibilities are greater than those of any previous set of delegates, because with greater success comes added responsibilities. What has been accomplished during the past year would take too long to enumerate, but I wish to call attention briefly to a few points that should not be lost sight of in the future.

The best information that I can obtain shows that there has been an increase in our system of more than 500,000 telephones during the past year. Franchises have been granted by overwhelming votes in the following large cities: Boston, San Francisco, Milwaukee, Denver, Omaha, Springfield, Mass.; Nashville, Tenn., and a number of smaller cities, thus leaving but a few centers of population where the Independents do not have adequate terminals arranged for. Practically all of the latter communities are controlled by bosses or political rings who have reasons for keeping them out.

In a number of states the interests represented by us have had, during the past year, all sorts of propositions made to them to sell out, to consolidate, to become sub-licensees, and even to purchase Bell exchanges; but with very few exceptions, and those few of minor importance, they have stood firmly by the principles of the association, refusing all overtures intended to weaken our cause; and, furthermore, a number who heretofore were sub-licensees of our competitor throughout the country have rejoined the Independent ranks so that today we are much stronger than even one year ago.

An attempt was made to place in unfriendly hands a few properties in the States of New York and Utah, which was stopped by the attorney general of New York, acting upon information supplied by our association, and the New York State association. A tentative proposition was made in Indiana by the field agents of the Central Union Telephone Company (Bell) to have the Independent interests take over a large percentage of the exchanges operated by the Central Union. This was promptly referred by the special committee with whom the proposition had been left to the State association, which, by unanimous vote, refused to consider it.

The year has been one of increased prosperity among the Independent companies. I find today a large majority of the companies are in a very much better financial condition; most of them have placed their properties on a dividend-paying basis, having decided to stop putting all their earnings into extensions and betterments, as was the custom during the early days of the Independent development. Most of them, however, are content to pay reasonable dividends and then put a substantial surplus back into the properties for extensions and betterments. In almost all cases investigated I find this amount to be equivalent to from 3 per cent to 10 per cent on the capital stock of the company. Co-operative companies in many cases have been incorporated and placed upon a business basis, and are now employing proper help and paying dividends. Our business and securities have become better understood during the year.

The association has furnished a large amount of information, which was gathered by constantly urging the importance of sending it in, to many of the eastern papers as well as the papers throughout the other sections of the country, and today a substantial percentage of the United States understands and believes that Independent telephony is here to stay, that there is a place for two telephone systems, that two telephone companies can get along in the same community as well as two telegraph companies, provided only that common sense methods are allowed to prevail.

The report prepared by Engineer Nichols for the New York Bureau of Franchises after he had visited thirty-six of the leading cities where telephone competition exists contains the following:

The Independent telephone companies which are now in operation throughout the country have accomplished certain desirable results.

First—They have, by a vigorous campaign, been the means of creating a new interest in the telephone business, resulting in a great increase in the number of subscribers of both Independent and Bell companies, which has been of great benefit to all users of the telephone.

Second—They have, by competition, compelled the Bell companies to give better service.

Third—They have been the direct or indirect cause of reduction of rates of the Bell companies.

The effect of the reduction of rates of the Bell companies, and the increased development caused by the Independent companies, upon the present cost of telephone service compared with that before competition may be stated as follows:

Users of the Bell telephones get better service and increased number of possible connections at less actual cost.

We know that our competitor has practically wrecked itself in trying to crush competition and to have the public believe that the telephone business is a natural monopoly; while we have been quietly attending to our business, charging fair prices for good services, regardless of the policy of our competitor. Everything indicates that the Bell has had an awakening. At any rate, many of the stockholders in the east have, and are insisting upon an accounting and a change in the business management which will show proper returns upon the new money invested. They are not satisfied to increase the number of telephones from 20 to 35 per cent in their subsidiary properties, and have them show less earnings than the previous year.

Twelve cities with competition, representing a population of over 2 000,000, show a development of one telephone for 7.4 population, while the same number of cities without competition, with a population of 650,000, show one telephone to 23.8 population with very much higher rates and unsatisfactory service.

A careful analysis of duplication of telephones in the following cities shows an average of only 12 per cent: Columbus, Cleveland, Dayton, Indianapolis, Kansas City, Louisville, Minneapolis and Toledo.

Mr. Nichols, in his New York report, claims an average of about 15 per cent in thirty-six cities. Every one will agree, I think, that if the two systems were owned and operated by the same company it would not be possible to save more than one-half of this duplication for the reason that a majority of

the business houses and offices do not have any more telephones today than are necessary to adequately take care of the business, so that in reality there is possibly a duplication that could be avoided of proximately 7 per cent. In other words, the general public is given more than 300 per cent greater use of the telephone where there is competition than where competition does not exist at lower rates, and far superior service, with a possible waste from duplication of only 7 per cent.

Allow me to suggest that the future policy of the various Independent companies in the United States which compose the system represented here today should be to disregard the policy of our competitor when it adopts any other than sound business methods. Attend strictly to your own business, furnish good service and charge fair rates. Do not show partiality to your subscribers, but treat them all alike. You are then prepared to meet every patron face to face, to make the proper accounting to your associates, officers and stockholders and still be prepared to meet any investigation that may be made by state, provincial or United States authorities. If your competitor does not follow this policy to the letter, it is only a matter of time when he will have to account for his delinquencies to one or more of these authorities.

The United States government, and, in some cases, the state legislatures, as you all know, have insisted upon the right of investigating with reference to rates charged by certain other organizations, and where they are found to discriminate, heavy fines are imposed.

Sooner or later similar investigation will be made of the telephone companies, and I think a majority of those assembled here will agree that it should be made, and then it would be as much of an offence to give telephone service at reduced rates or free, as it is for the Standard Oil Company or the raliways to discriminate.

The attacks of our competitor have been most vicious, not only through the press, but through hired field agents who are said to receive an allowance of nearly, if not quite a million dollars per annum, for distribution in this manner, or 5 per cent upon $20,000,000 for war measures. A striking illustration was that of the proposed sale of the properties of the United States Independent Telephone Company in New York, which it announced as being the backbone of the Independent movement, while in reality it represents less than 1 per cent. All sorts of changes were also rung upon similarity of names until the public became hopelessly confused, until this association sent out a bulletin to all companies and the newspapers setting them right on the subject.

The press undoubtedly tries to print only information that is furnished on what it believes to be good authority, but in many cases it has found telephone items so far from the truth that a number of papers have been making investigations of their own and have found that they were being used as tools and thereby put in the embarrassing position of having to apologize and to furnish the other side of the proposition to square themselves with their readers. It therefore behooves us to attend strictly to our own business and give out only facts that can be substantiated. Do not overrate your position.

The securities of many of the other public-serving corporations of the United States have declined in value during the past ninety days from ten to thirty points, but Independent telephone scurities seem to have withstood the attack during this period with slight loss, because, among other things, experience has shown that wire-using companies are making more money during periods of depression than during times of prosperity.

Why should there be any disposition to furnish telephone service at less than cost? There are in the United States today approximately 7,000,000 telephones, or about one to thirteen of the population. If we had one telephone to 7.4 of the population we would have at least 12,000,000 telephones, or approximately 75 per cent greater development than we have today, and I do not believe the telephone business in any of the large cities in the 7.4 class has been fully developed, with the possible exception of Los Angeles, which has one telephone to every four of population. Mr. James J. Hill estimates that there will be 200,000,000 population in this country in 1950, which will require, at a conservative estimate, 35,000,000 telephones, or five times the present number.

The International association finds the demands upon it to be similar to that of the operating companies from the fact that the more active the association is in carrying on its work, the greater the calls are upon it. The past two years' work has convinced me that there is a necessity for a good strong central organization. During that time the Independent telephone business has been radically changed. We have been gradually systematizing our work along uniform lines so that today we have fair uniformity and methods of advertising, accounting, routing of business over interconnecting toll lines, construction and operating rules and regulations, and while they are not analogous in all respects, there is a certain uniformity running through them that makes the system more complete. There is, however, a necessity for a stronger and better organization. The plan we are working under has proved to be worthy of greater support than has been given it; or as some one has just put it, "The national, state and district associations are organized for the benefit of all the Independents, whether small or great, and the Independents should come to the support of this association as strong as possible, for the more they help the International association the more the association can help them." It has cemented together the various interests into a more perfect union and has furnished a foundation and superstructure sufficient to take care of the business of the future. Many of the state associations of bankers are organizing upon the district plan, or "group plan," as they call it, and in Ohio they promise to have nine districts like the Ohio Independent Telephone Association. Our system will require some slight changes and modifications from time to time in order to meet changed conditions. What the association needs today is sufficient funds to carry on its work without anxiety on the part of its officers as to where the moey is to come from. It must not be dependent upon voluntary subscription or charity for its maintenance.

Our greatest danger today lies in the fact that too many of our members are overconfident, feeling that we have a strong organization and that it does not require any work or effort on their part to keep it in that condition. In other words, the burden is thrown upon some one else to do the work, pay the money and spend the time upon matters of special importance to every one in this business. Some of you come here representing your respective companies and make verbal promises with reference to funds to be provided during the year to carry on this work; indorse the work done and ask other work to be undertaken that means additional expense; elect officers to do this work, promising them support; in some cases find fault with what has been done in order to justify your neglect, and then go home and fail to carry out your part of the work planned for the following year. This organization, as I have said, is necessary, but in order to be a success it can not be run in a half-hearted way, neither can it be run so as to get the best results unless it has the active support, financial and otherwise, of all interests in the field.

This association should be incorporated under the laws of some state favorable to the association's requirements. The corporate body so formed to acquire and own the records of the association, and to be presided over by fifteen trustees, who shall be elected by this convention, three for five years, three for four years, and so down. At the next convention they will elect three to succeed the three whose terms will then expire. This body should be the financial organization of the association; the president of the association to be the chairman of the board of trustees; the trustees to be representative telephone men representing the various branches of the business; the trustees themselves to elect each year from their number a president, vice-president, secretary and treasurer, who may or may not be the same as the officers of the association. They shall take entire charge of providing funds and paying all bills; their treasurer to be also treasurer of the association. This would limit the liability of the association and yet provide it with sufficient responsibility so as to enable it to carry on its work, and I believe this plan is sufficiently broad to entirely eliminate political influences from the organization.

We should provide for additional groups, or sections, so as to take care of the manufacturers' section, supply men's section, publishers' section, engineers' group or section, and honorary membership section. These groups should be limited as to the number of representatives they would have, so that the combination of the outside sections at no time should represent more than, say, one-third, of the total delegates entitled to attend any one convention. This representation should be based upon certain requirements from these different groups and upon certain payments to be made by them to the association at stated times during the year.

It is essential that we stand together for many reasons: First, we need uniformity of action along every line; second, we need the assistance of all others engaged in the business, because it takes all to complete our system; third, as we now stand we are one big family.

The strength of organization was quite clearly demonstrated in both the Indiana and New York cases within the past six months, and has been of very great assistance in the states of Wisconsin, as well as Ohio, Michigan, Iowa, Texas, West Virginia and many other states.

Without organization the legislatures in many of the states would be inclined to pass measures unreasonable and unjust to our interests, not to impose a burden on us, but through lack of information on the part of those introducing them. For instance, compulsory interconnection bills have been introduced into a number of the legislatures during the past year and the subject is being agitated by the press of almost every state where the

Independents have a strong foothold. In most of the central, western, northwestern and southwestern states, bills have been introduced during the legislative sessions just closed providing for compulsory connection. In states whose legislatures will not meet until next winter similar bills will be introduced. The officers of the various state associations should at once inaugurate a campaign of publicity, pointing out the injustice of compulsory connection, which is an interference with private property rights, and would have a tendency to stop all further development of long distance lines. Stockholders of local companies should be informed by the managers of their respective systems of the operating disadvantages incident to compulsory connection, so that they can represent the Independent side of the controversy intelligently to their representatives in the state legislatures. In all matters pertaining to legislative affairs, telephone operators should secure the co-operation of their stockholders, because from a political point of view they have more influence than the men actively engaged in the management of the business.

Our business is one that is peculiar and cannot always be properly analyzed along the same lines as other business. Many business organizations are raising from $25,000 to over $100,000 annually for the purpose of further developing their business and eliminating certain evils that have been gradually creeping in.

The executive committee at its last meeting voted to establish a publicity department, which, in the judgment of the members of this committee, is of vital importance, in order that authentic information may be prepared to keep the press of the country properly informed with a view of strengthening our

View of the Opening Session of the International Independent Telephone Association.

securities and educating the public to our business; the press department not to be used for the purpose of fighting our competitor, except in cases where our cause is misrepresented or unduly attacked by it; its principal purpose should, however, be constructive and in no sense destructive. It should also be educational and help to get the board of directors, managers, subordinates, stockholders and the subscribers to see and more fully appreciate the importance of the business they are engaged in or depending upon. How would you regard a bank in which you were interested that never published a statement or did anything to inform you about its business? There are thousands of security holders in the various companies represented here who have no idea of the scope of the business in which they are interested. Therefore it is no wonder that they are in doubt about its substantial values.

The necessity for this organization is well illustrated in the work being done by the local chambers of commerce in the various cities, which are supplemented by the state board of trade, and these by the national board of trade. Why do our companies get weak-kneed once in a while? Why do they consider at any time making a deal with their common enemy? Because the boards of directors and officers themselves do not understand their strength. The quicker they realize that strength and use it properly the quicker their proportion will become better regarded and stronger in their respective communities.

Telephone service which up to the present time has been given almost exclusively on a flat rate basis by the Independent companies is subject to the same abuses and waste as the unchecked supply of electric current, gas and water; and there is unquestionably a growing demand on the part of the consumers as well as the management of the companies to have the service placed on a meter basis that will equalize charges between the various consumers and eliminate many of the annoyances to which the business is now subject.

The year's record on long distance work shows up very favorably, as compared with that of previous years. The high price of copper during the past six months has been responsible for closing down considerable construction work that would otherwise have been done. The various long distance companies are gradually increasing their earnings by leasing their circuits to brokers, manufacturers, newspapers and others for telegraph purposes.

In this connection I wish to call your attention to the fact that statistics show that over 85 per cent of the long distance messages are for points within a radius of fifty miles of the original station, and might further state that the great majority of local companies are provided with adequate facilities for furnishing such connections now and are adding additional circuits to their lines, from time to time, to keep pace with the growth of local exchanges.

A number of consolidations have been made during the year, confined principally to consolidating long distance lines into larger groups and to exchange companies taking over the smaller exchanges surrounding them. There is an opportunity for doing very effective work along this line as it is done with care and not so fast as to make the new organization unwieldy. Care should be taken to finance such mergers conservatively.

Gathering data for the long distance maps, as will be shown by the secretary's report, has been very tedious work, and yet it is a work that has great value. I recommend that each delegate in attendance examine the maps that are on exhibition. The association took up with this work not with a view of making a profit out of it, but for the purpose of gathering data that could be relied upon, as a great majority of the maps in existence at the time this department was started, more than a year and a half ago, were largely of a "chalk-talk" character. The maps on exhibition can be vouched for by the Independent telephone interests of the country. Copies of them can be had at a nominal cost and one or more will be of great value to all companies, as they show the development in practically all the states of the Union.

The work in compiling data can be discontinued for a period of six or nine months, but I would recommend that it be followed up from year to year so that all new lines and additional data gathered may be properly recorded before each annual convention.

The supply department during the past year made a small profit over expenses, as it did the previous year, and its work, in my judgment, should be continued by the association for at least another year, and should be supported by the companies everywhere, because they are all interested in pushing their business, or should be. I am told that our competitors have more than fifteen signs on an average to our one. Is it any wonder that they are regarded as the long distance company of the country and we as the local companies?

It has been frequently suggested that the association should have a traveling secretary who would give at least a portion if

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not all of his time to visiting the different state associations for the purpose of working out more uniform methods in the various states, helping to strengthen the state organizations and attending their annual conventions. During the early part of this year we had Mr. Stadelman of Iowa visit a number of the state conventions and the reports we received in Cleveland of his work indicated to us that such a plan could be made very effective. It has also been suggested that the various state associations should arrange a schedule for dates of holding their annual conventions to be arranged one or two weeks apart and with some regular order so that the traveling officer, as well as any others who might be able to attend one or more of the conventions, would be able to do so and minimize traveling expenses.

At the January meeting of the executive committee, a plan was submitted by a number of the operators providing for honorary membership in the association upon the payment of $25, the association to issue cards entitling the holders to certain privileges. The association has issued seventy-two of these cards to representative telephone men scattered over the country. I would recommend that these honorary members hold a meeting and appoint a committee to co-operate with the committee on constitution and by-laws with a view of being made a part of the International organization by having an honorary members' section, which would be entitled to, say, one delegate for every ten members of the organization.

Our present constitution provides for assessments to be levied against the various state organizations on a basis of not to exceed one cent per unit per year. A number of the manufacturers have expressed a desire to place stamps, to be furnished by the association, on a basis of one cent per unit on each telephone and each switchboard drop, while certain manufacturers of telephone supplies have announced their willingness to contribute one-twentieth of one per cent of their gross receipts from the Independent telephone interests. This plan has been discussed with a number of the leading operators and they feel that it is one that will probably equalize contributions from the supply houses and manufacturers better than any other that has been suggested.

In my remarks thus far I have attempted to give an outline of the Independent situation so far as it relates to the work of the association.

In conclusion, I may be pardoned for referring to matters personal. After three years of service I cannot retire from the executive committee without thanking my fellow officers and committees for their co-operation and assistance. Through their substantial efforts the success of the association has been made possible. I also desire to thank the officers of the various state associations, the delegates to our conventions, the honorary members and all others who have given their support to the association.

On three different occasions this association has honored me by election to the highest office within its gift and has shown its faith in my judgment by adopting the "Ohio plan" of organization which I originally worked out in that state, as well as by many other tokens of confidence. Friendships have grown out of these relations which are growing dearer from day to day, but the gratitude which I now express for the many honors conferred on me extends far beyond personal friends and acquaintances and embraces every man interested in the cause for the advancement of which we are all working together.

Much has been accomplished. More remains to be done. Therefore I would ask you to give to my successor the same loyal support which has enabled me to make the work of the association of practical value. This association is your association, and not until every Independent telephone operator in the United States and Canada has become one of our members and all are filled with the spirit of devotion to the movement, must the work of propaganda cease. We must stand solidly together, shoulder to shoulder, loyal to the cause, to our officers and to our associates, thus winning the approbation of our own conscience and the good will of the people.

The president's address was received with loud and continued applause.

Mr. Harney then read the following report:

All necessary changes have been made to bring our card record of Independent companies right up to date, and we have increased this list by 2,642, so that it contains at present the names of 10,042 companies, all of which are strictly Independent, according to the best information obtainable. We have recently secured a list of over 10,000 cities and towns having Independent service, with the name of the company at each place, also considerable information regarding the organization of new Independent companies. Neither the list nor the other information has been checked against our card record, and both doubtless contain many names not included in this record, which, when added, will probably increase the total to not less than 12,000 companies.

The association is in a peculiarly advantageous position for securing information of this nature, and the list may justly be considered one of its most valuable assets, well worth any reasonable expenditure to keep it constantly complete and up to date.

Acting upon the instructions of the last convention, 5,000 copies of convention proceedings were printed. These were ready for distribution about October 30th. No efforts were spared to make this report as useful as possible to all branches of the Independent industry. Besides the verbatim record of the daily sessions, it contains a full report of the banquet, copies of all papers and committee reports, list of all association officers and committees, alphabetical list by states of all attending the convention, constitution and plan of organization of the association, with an appendix of important data brought out in the discussions reports, papers, etc., classified for ready reference under states or subjects, everything being indexed so that it may be quickly located.

To insure the widest possible distribution of these books the price was fixed at twenty-five cents for single copies, post paid, with a special price of twenty-two and one-half cents in hundred lots, which was merely sufficient to cover the cost of publication. A circular notice was sent to all of the Independent companies at that time on our list, approximating 8,500, and also to all who registered at the convention, amounting to 750. Only 912 copies have been disposed of to date. This is to be regretted, because the report as a whole is a complete and authentic history of one of the most remarkable conventions ever held by the Independent interests and is deserving of a place on the desk or in the library of every one interested in any way in the Independent industry. The Indiana association purchased a copy for each of its members, and a number of the larger companies who have bought quantities of the book to be used in interesting financiers and investors in their properties recommend it as one of the best documents that was ever prepared for this purpose.

The association is anxious to dispose of the copies it has on hand, and believes if the value of this book is understood there will be no difficulty in doing so. For the benefit of all who may wish to make up for lost opportunities we have arranged to have these books on sale during the convention at a nominal price of 10 cents each.

Besides the proceedings the last convention instructed the association to publish the constitution separately in book form. This was done, 1,000 copies being printed in the form of a small booklet and distributed free among the officers of the various associations and others desiring same.

In accordance with recommendations of the last convention, shortly after adjournment three members of the committee on Standard Operating Rules and Regulations were appointed as a permanent committee on this subject, to continue their work during the year, and a permanent committee of five on standard forms of accounting was appointed October 2d. Two additional members were appointed some time ago to assist the first named committee in completing their work, and both of the committees have been instructed to bring in reports at this convention.

During the past year the supply department again demonstrated its value in carrying out the purpose for which it was organized, namely, standardizing and extending the use of the official shield. Up to date the association has furnished shield supplies to Independent companies in forty-four states. The supply department was never intended primarily as a money maker, and has not been operated as such. Its supplies have been furnished at prices considerably lower than could be obtained by the individual companies, and yet it shows a profit during the past year of $598.03.

Judging the supply department by its work since the time it was organized, there can be no question as to its value to the Independent companies of the country as the best means that could be adopted for increasing the general use of the shield, and there is no doubt of the determination of a large number of the Independent companies to give it their support. It is entitled to the support of all in the field, and, given this, its usefulness could be increased many fold. At no time has the supply department been given the attention it really merits, but past experience indicates that any expenditures necessary to enlarge and extend it would be amply repaid through the increased business, and the greater use of the shield secured in this manner would redound to the benefit, in general advertising, of the entire movement.

As a matter of general information, I am instructed to announce that it has never been the intention of the association in establishing the supply department to make it a general purchasing agency for the Independent interests. Shield supplies only have been handled, and on a number of occasions, both before and since the last convention, we have refused the agency of various accessories which were offered us. The mission of the supply department is to extend and increase the use

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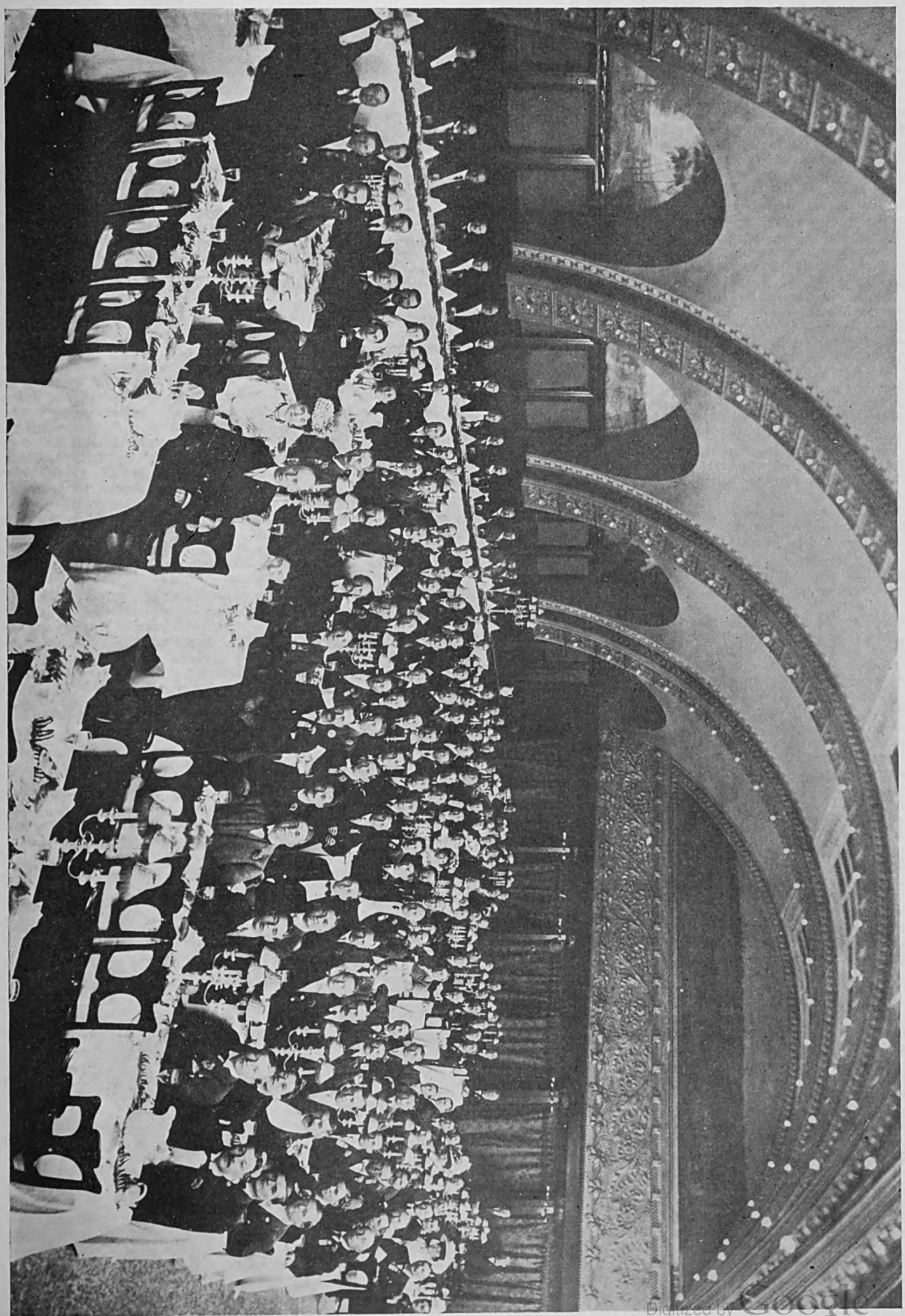

Banquet of the International Independent Telephone Association at the Auditorium Hotel, Chicago, Wednesday Night, June 5, 1907.

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of the shield, an object entitling it to the hearty co-operation of every one in the field.

Great progress has been made in compiling maps during the past year. At present the association has on hand government post route maps, with tracing of same ready for making blue prints, of every state and territory in the Union. Information has been received from, and spotted on tracings for, forty-two states, and we can furnish printed maps or blue prints showing from forty to ninety per cent of the existing Independent toll line development for fifteen states, and a special blue print showing important long distance connections in the territory from central Nebraska to the Atlantic seaboard and south to and including a part of Alabama.

The data on file includes maps furnished by 1,252 individual companies and twenty-eight maps covering a state or group of counties received from state or traffic associations, the whole embracing lines of about 1,350 toll line companies.

While the progress of the map department is encouraging, it is far from satisfactory, and much more could have been accomplished if greater interest in this matter had been taken by all of the individual companies who were requested to furnish information. As an example of the indifference with which we have had to contend in securing the necessary data, there are letters sent by us to 903 companies remaining unanswered. Of these companies those located in Illinois have each received an average of fourteen letters, those in Indiana twelve, in Kentucky and Nebraska ten, ranging down for other states on which we have been actively working to two and three letters. All told, 4,651 letters have been sent to these 903 companies. On the other hand, many of the companies have been very prompt in responding to requests for map data, and are entitled to our thanks. If all of the Independent people who are requested for information could but realize the value of our maps not only to the movement as a whole but to their own companies in showing that they are a part of this great movement, this unnecessary expenditure of money and effort would be obviated.

That the maps have a distinct commercial value to the Independent interests is evinced by the fact that since the establishment of the map department 160 blue prints have been sold, exclusive of 597 Ohio maps, which were printed for distribution at a purely nominal price. In addition to this, we have had a large number of inquiries for maps of the various states in a cheaper form than we have yet been able to furnish them, and for information regarding connections, etc., which could only be shown by a map. We are assured by persons to whom our maps have been furnished that an authentic record of this kind is one of the best means that can be used in interesting financiers and investors in the Independent movement, as it shows at a glance what the Independents have done and the revenue possibilities of their properties. The value of the map department as part of the association work is unquestioned, and with the proper co-operation of all of the Independent interests the expense of maintaining it would be greatly lessened.

Besides working on our maps we have been constantly adding to our other data and now have a comprehensive list of rate sheets showing the situation before and after the introduction of competition in representative towns, including all of the larger places, also letters from city and state officials, business firms and representative men at various places, endorsing competition, and a great deal of other information of a statistical nature for various states and the country as a whole.

This information, particularly the rate sheets and letters, has been in great demand by the Independent interests who were seeking new franchises in various parts of the country, including such important places as Providence, Boston, Milwaukee, Hartford, Omaha, Denver, Nashville and other southern cities; and we have been informed by many receiving this information that it has been of invaluable assistance to them in preparing booklets, newspaper advertisements, briefs, etc., in order to properly present their case. It is remarkable how little is really known regarding the Independent movement by otherwise well informed people.

At Hartford, Connecticut, the figures presented by the Independents were questioned in open court by their competitor, but the association had no difficulty in securing ample proof in the shape of affidavits, copies of old bills and vouchers, etc., substantiating the information furnished.

Among other things, the association has had, during the past year, to check up briefs and other documents intended for use by the Independent people for the purpose of correcting or supplementing the figures and general information on which these diagrams were based, and to check up and furnish information necessary to refute various published statements made by the Independents' competitor. We have also, upon request, secured photographs of Independent buildings, lines and equipment for Independent people in preparing exhibits to show the extent and substantial character of Independent properties for use at public hearings before committees appointed by state or civic bodies.

A nominal charge necessary to cover the cost is made for all work of this nature and for furnishing data previously referred to, and in no instance is assistance of this kind given to any but bona fide Independent people. If unknown to the association officers, those seeking such help must first present satisfactory evidence that they are entitled to the assistance requested.

In securing the information of various classes as above outlined, it has been necessary, of course, to call upon Independent companies in various parts of the country, and with scarcely an exception this information has been furnished with commendable promptness. The association thanks all who have rendered assistance in this matter.

During the past year the monthly bulletins inaugurated after the 1905 convention were continued, copies of same being furnished to all of the Independent telephone journals in the field, and special bulletins covering the situation in New York state, which threatened to affect practically the whole country, were mailed to all of the Independent telephone companies in the United States and Canada, as well as to the executive officers of the various associations and to the press and journals. Special bulletins were also sent out recently on the situation in Indiana and Ohio. In addition to the foregoing, notices covering important subjects have been sent out whenever necessary to the executive officers of the state associations and leaders in various parts of the country, and on a number of occasions special articles presenting the Independent situation have been published in papers outside of the technical press, either as a matter of general information or in answer to misleading articles published by our competitor.

At present there are Independent telephone associations in twenty states and Canada, and a number of new organizations pending; seventeen of the existing organizations, including Canada, have applied for membership in the International association. A number of others are considering the matter and may present their applications at this convention. The International association keeps in close touch with all of these organizations, whether members or not, and on matters of general interest all of them may be considered as affiliated with the International.

The steadily increasing attendance at conventions may be considered as an evidence of the progress of the Independent movement and of greater interest that is being taken in organization. The attendance at the 1905 convention of the National Interstate Association was approximately 250. This record has been broken at a number of state conventions during the past year, notably those of Illinois, Indiana, Iowa and Ohio, and the attendance at the 1906 International convention, according to the registration record, was 750. The attendance this year promises to exceed that of last, and the exhibits this year will fill over fifty rooms and the writing room, which breaks all previous records.

According to the information received by your association from all parts of the field, the past year, considered from every point of view, has been the most successful in the history of the Independent movement, and the coming year will be productive of still greater progress.

The assistant secretary's report was received with applause.

THE CHAIR: The next will be the reading of the committees that were appointed yesterday by the advisory board.

MR. HARNEY: Committee on amendments to the constitution, Charles E. Sumner, chairman; F. H. Woods, Theodore Gary, M. B. Overly, Judge Smith. Will meet at room 704 upon adjournment.

Committee on credentials, A. C. Lindemuth, chairman; Alpheus Hoover, G. S. Shanklin, W. H. Nelson, W. H. Bassett, T. H. Ferris, G. W. Thompson, E. H. Pollock, F. D. Houck, J. B. Ware, J. W. Barnes, E. H. Moulton, W. T. Wynne, F. H. Stowe, Houck McHenry. Will meet at the close of this session in room 512.

Committee on resolutions: James S. Brailey, Jr., chairman; C. W. Kline, S. S. Lichty, W. J. Uhl, W. B. Woodbury, Manford Savage. H. D. Critchfield.

Nominating committee: D. E. Sapp, chairman; O. C. Snider, Charles West, Richard Valentine, H. S. Baker, E. L. Barber, M. L. Clawson.

THE CHAIR: We have arranged for a question box at this convention. I will appoint, as chairman of that committee, C. S. Norton, and his assistants, C. B. Cheadle and Mr. Boqua.

THE CHAIR: Mr. West, chairman of the auditing committee, will read the report of the treasurer.

MR. CHARLES WEST: Mr. President, as chairman of the auditing committee to examine the accounts of the president for the past year, the committee reports as follows:

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We beg to report that we have examined the statement made by the public accountant authorized to audit the books of the International Independent Telephone Association, which has been duly sworn to, and that he reports everything to be in good condition.

From this report we find that the total receipts from June 16, 1906, up to and including May 25, 1907, amounted to $17,444.11;

That there was a cash balance on hand, June 16, of $1,113.73, making a total of $18,557.84.

We find the total disbursements amount to $18,241.60, leaving a balance in the treasury of $316.24.

The total assets of the association amount to $4,254.39 and the total liabilities to $5,945.51, leaving a deficit of $1,691.12, which has since been provided for. Respectfully submitted,

CHARLES WEST, Chairman;
C. S. NORTON,
CHARLES C. DEERING, Auditing Committee.

MR. C. W. KLINE: I would move you, Mr. Chairman, that the report of the president, the secretary and the auditing committee be accepted and spread on the minutes, and that a special committee be appointed to consider the questions submitted by the president, in his annual report, regarding the incorporation of the International Association. I would suggest a committee of five.

The motion was seconded and carried.

THE CHAIR: We are now ready for the practical talks. I will call on Mr. W. C. Pope, if he is in the house, to help out with the subject of construction problems. Mr. Pope is an engineer who has had very broad experience along this line, and I would like to hear from him.

MR. POPE: Mr. President and gentlemen: The only difficulty we have been having recently in the construction field is getting the money to pay the bills, consequently we have ceased construction.

THE CHAIR: Has any one else anything to say on this subject? Is Mr. C. E. Tarte in the house?

MR. TARTE: I do not believe I can say anything on this subject, Mr. Hoge, but I suppose, for the purpose of getting things started, somebody ought to say something. About the only thing I would care to say on the subject would be this: Most of us have been a little bit frightened about the price of material the last six or eight months, and I am afraid with a good many of us it stopped our work at a very inopportune time, waiting for prices to go down, especially in the construction of toll lines. It seems to me that instead of waiting some six months longer in the construction of toll lines that we had better, those of us who have pole leads up, buy copper, even at the present prices, and increase our business, because we can surely make good profits on new toll lines, even if the price of materials continues to rise.

To go into details as to how we should do such construction would be rather presumptuous on my part. I have a little idea of how to go on with our own lines, but to attempt to tell this meeting how lines should be built would be a foolish proposition. But I want to urge upon all to go right ahead with the construction of toll lines, because our competitor is going in hard on that proposition, and unless we do something quick we are going to have some more movements like the Bell tried to start in Indiana last week.

THE CHAIR: We would like to hear from Mr. Chas. E. Sumner on this subject.

MR. SUMNER: Mr. President, if there is anything in the world that I don't know anything about, it is the construction business. It has not been along my experience. I wish to say, however, that so far as the northwest is concerned, the construction is progressing very satisfactorily. We are trying to cover the entire two states of Oregon and Washington, and we have not found any difficulty such as has been suggested by the first speaker.

THE CHAIR: I will announce the committee that was suggested by Senator Kline: Frank L. Beam, R. E. Mattison, W. S. Vivian, A. C. Davis, Alpheus Hoover.

THE CHAIR: I will announce the committee that was sug- here is "Shield Advertising."

MR. WEST: I have just had handed to me an act passed by the Pennsylvania legislature a few days ago, prohibiting the use of the shield in any shape, manner or form for advertising purposes. That is going to be quite a proposition for us in that part of the country. It is very short. I will read it, with your permission:

Section 1. Be it enacted, etc., That any person who, in any manner, for exhibition or display, shall place or cause to be placed any word, figure, mark or picture, design, drawing or any advertisement, of any nature, upon any flag, standard, color or ensign of the United States, or of this state; or shall expose or cause to be exposed to public view any such flag, standard, color or ensign upon which shall be printed, painted or otherwise placed, or to which shall be attached, appended, affixed or annexed, any word, figure, mark, picture, design or drawing, or any advertisement, of any nature; or who shall expose to public view, manufacture, sell expose for sale, give away, or have in possession for sale or to give away or for use, for any purpose any article or substance, being an article of merchandise or a receptacle of merchandise, upon which shall have been printed, painted, attached or otherwise placed a representation of any such flag, standard, color or ensign, to advertise, call attention to, decorate, mark or distinguish, for the purpose of sale, barter or trade, the article or substance on which so placed; or who shall publicly or privately mutilate, deface, defile or defy, trample upon, or cast contempt either by words or act upon any such flag, standard, color or ensign, shall be deemed guilty of a felony, and shall be punished by a fine not exceeding five hundred dollars, or by imprisonment for not more than six months, or both, in the discretion of the court.

Section 2. The words, flag, standard, color, or ensign, as used in this act, shall include any flag, standard, color, ensign, or any picture or representation of either thereof, made of any substance or represented on any substance, and of any size, evidently purporting to be either of said flag, standard, color, or ensign of the United States of America or of this state, or a picture or a representation of either thereof, upon which shall be shown the colors, or any color, or any combination of colors, or either the stars or the stripes, or the stars and the stripes, in any number of either thereof, or anything which the person seeing the same, without deliberation, may believe the same to represent the flag, colors, standard, or ensign of the United States, or of this state.

Section 3. This act shall not apply to any act permitted by the statute of the United States of America, or by the United States army and navy regulations; nor in case where the government of the United States has granted the use of such flag, standard, color, or ensign as a trade-mark; nor shall it be construed to apply to a newspaper, periodical, book, pamphlet, circular, certificate, diploma, warrant, or commission of appointment to office, ornamental picture, or badges, or stationery for use in correspondence, on any of which shall be printed, painted, or placed said flag, or representation thereof, disconnected from any advertisement for the purpose of sale, barter, or trade; nor shall it apply to any patriotic or political demonstration or decorations.

With all the rest of the delegates at the convention a year ago, we adopted the ensign and shield as a trade mark all through Pennsylvania, and we have very largely distributed these signs and today Pennsylvania is practically covered with the shield. Of course, under this act it would seem that by the dictates of the law we will have to do away with it. I would like to bring the matter up at this time for discussion and get the benefit of advice from the members present.

Chas. West.

MR. KLINE: I heard that act discussed in the legislature. I never saw the act and never heard it read, but it was the idea of the Pennsylvania legislature, as conveyed to me by those who had the matter in charge, that it was to avoid the desecration of the American flag. The shield we use here would not, in their judgment, simply because we have the colors of the American flag, be a desecration, and the act would not apply to the shield, which we have adopted. Of course, that is a question for construction. I could not catch it carefully as Mr. West read it here, and I do not know whether it would apply to our shield in the shape we have it or not; but the idea of the legislature, as conveyed to me, was to stop using the American flag for advertising purposes. I think all Independent telephone users over the United States will join in that sentiment. We do not want any desecration of the American flag; but simply to use the shield that has the colors of the American flag, I do not think is a desecration of the American flag.

THE CHAIR: Is there any further discussion on this subject, gentlemen? It is one that has been up before, and I understand there is a general United States law on this subject. so far as the flag is concerned, but I never heard of its interfering with the use of the shield.

MR. C. S. NORTON: Mr. President, there will be a question box placed on the table and any one who has a question he desires answered will please place it in the box. Write it out legibly, because this committee can only read the best of writing. And each time on the program where "Question Box" occurs those questions will be read and answers called for.

The convention met Wednesday pursuant to adjournment; the president in the chair.

THE CHAIR: The convention will please come to order. If the sergeant-at-arms will request those outside to come in and be seated, we will get down to business.

If there is any one in the room at the present time who has not arranged for banquet tickets for tonight and who wants to attend, I wish he would take up that subject immediately, because the committee has to notify the hotel people within the next twenty minutes how many will attend. We guaranteed last year more than we had and it was rather an expensive luxury. We want to save money this year and only guarantee such a number as we shall have tickets for.

"Independent Improvements and Possibilities," by C. E. Tarte, of Grand Rapids, Mich. Mr. Tarte is always on hand when he is wanted. We will now hear from Mr. Tarte.

MR. TARTE: Mr. Chairman, Gentlemen of the Convention: I am very glad I received the applause ahead of time. I am afraid when I get through, I won't get any more. I understand that these papers are simply for the purpose of starting discussion. I say this as a sort of apology for my paper, because there is so little to it, but in the hope that it may bring some discussion, I am going to read it to you.

(Mr. Tarte's paper may be found in another portion of this issue.)

THE CHAIR: Is there any discussion on Mr. Tarte's very excellent opening of this subject? We are now ready to hear general discussion on this topic, after which we are ready to take up the roll call of states.

MR. TARTE: Mr. Chairman, I could add a little to the subject along the line of what the traffic association has done in Michigan. We started a traffic association there about three years ago, and until that time found it was almost absolutely impossible to handle our toll business after it left our own lines. Each company had the idea that it was entitled to all it could get in and the result was trouble all the time. Since we started the traffic association we have every toll line company in the state in it, and each company stands its share of handling the business of the association, according to the amount of business it does through the clearing house. We are having no difficulty whatever in handling the business. The companies feel that they are getting their share, and those of us in the larger companies feel that we are justified in putting in more lines. I would like to urge every state to get together on this proposition. We would be glad to help you. Our Michigan association will give you any help we can, and two or three of the others that are organized are willing to do the same thing. If there are any questions to be asked about the details, there are Michigan members here and I think they will help you out.

THE CHAIR: Is Mr. A. L. Tetu in the house? He has had a lot of experience on long distance lines. Let us hear from him on the long distance subject.

MR. TETU: It is a big subject to be called upon to respond to on short notice; but if you will leave out the "Improvements," Mr. Chairman, and let me talk on the "Possibilities," perhaps I can come directly to the point in a few words.

I regard the possibilities of the Independent movement today as being in perhaps the most promising condition in the history of the telephone service. My statement is based upon the recent unsuccessful efforts in Indiana of the Central Union Company (Bell) to become associated with us.

I believe in what was suggested by my friend Mr. Sapp at the Indiana banquet, when he said, in more eloquent language than I can command, that he believed in the old Mosaic law, of an eye for an eye and a tooth for a tooth, and I fail to see why, after the battle of the last ten or twelve years, during which the Bell has been entirely relentless, we should now extend the olive branch. I am minded, if you please, of the old Roman legend, the speech of Spartacus to the gladiators. It is this:

"Ye stand here like giants, as ye are, but tomorrow some Roman Adonis (in the shape of a Bell telephone man, if you please) will pat your red brawn and bet his sesterces upon your speed. If ye are beasts, then stand here like fat oxen watching for the butcher's knife. If ye are men, stand together (he didn't say that, it was 'follow me,' but I say 'stand together.') Look on yon flag, gain the mountain pass, and there do bloody work, as did your sires at old Thermopylæ."

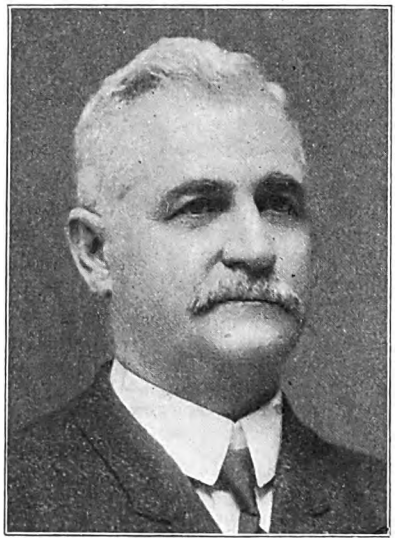
That is the spirit we want to show now.

This is not the time for surrender. This is not the time for any consideration of the advances from the other side. The Bell has never given us any consideration. Why should we give it consideration now? We have the opportunity, from every point of view, of strengthening the Independent cause better than ever before. Now let us stand together and do it.

I am going far away, as far as I can get and stay in God's country, but I want to watch this situation. We depend upon you, morally at least, for the success of the Independent enterprise, and the eyes of the whole country today are on this International Independent Association, with especial reference to what you are going to do with the Bell proposition.

THE CHAIR: Has any one else anything to add on this subject? It is a very important one, gentlemen, something that we are all vitally interested in.

MR. C. W. KLINE: The question of the long distance toll lines of the Independent telephone companies of America is a very serious one, and it has never been attacked in my judgment in the manner it should have been. The sooner the Independent telephone companies in the United States realize that the long distance must be divorced from the local companies if we are ever going to give successful long distance service, the better. How that can be brought about is a question for discussion. My own view, which I have tried to impress upon our state, is that all the interests in the state should get together and form an overlying long distance company, whose management should be entirely in the hands of a long distance management, regardless of local conditions. This talking through exchanges, across the state, sometimes our line, sometimes inefficient copper, is never going to impress upon the



C. W. Kline.

public that we are giving satisfactory long distance service. We have been attempting to do that in some places in our state. So far as our own companies are concerned, extending some two hundred miles, we have a standard long distance line that gives satisfactory service, but just as soon as we get off it and connect with some of our neighbors' they say our service is no good. We get the blame for it. It doesn't make any difference how good our lines are, we are met with the weakest link in the chain, and some system must be devised, if the Independent telephone companies are going to give satisfactory long distance service, of making overlying companies. Take in whatever territory you may need, but build standard lines, connect with standard lines, and give the public the service they are entitled to have. There may be some other way of working this out, but you must build standard long distance lines. You cannot talk through exchanges and all that kind of thing and expect the public will patronize your service. You cannot give service that way.

MR. HULETT: Mr. Chairman and Gentlemen: It seems to be the consensus of opinion that we should have long distance telephony. We are all agreed on that. The question seems to be, how are we going to get it? It takes money. A united action by the Independent telephone men will ultimately bring about a system of long distance telephony. A careful study of the situation, covering four years, and the recent development in a certain field leads me to believe that there is now an opening. I refer to the attitude of the Western Union and Postal Telegraph companies. I believe that before we will ever get the long distance telephone service that we want, we will have to enter, in a measure, the telegraph field. Some three years ago there was a movement started here in Chicago to do that. Circumstances were against it at that time. Recent developments, the rise in charges of the Western Union and Postal Companies —20 per cent and in some places 75 per cent—have simply dumbfounded our business men, who are extensive users of telegraph service. There is no reson, in my mind, why the telephone and the telegraph business cannot be consolidated. I saw only recently that the Western Union and Postal Telegraph com-

panies have consolidated in a measure; that they have gone so far in New York city, in hotels where they have two offices, Western Union and Postal, to take out one or the other. I believe that a movement emanating from the Independent telephone people would bring to your support many of those extensive users of telegraph and make them telephone people. It will ally with you, for instance, the leased wire people. Several concerns in Chicago are today using a half a million dollars' worth of leased wires. Make their fight your fight, your fight theirs. It will bring to you new blood and new capital. With those allies you can build your telephone lines and you can operate them. The great American people have not lain down today to let the Western Union president and the Postal president get into a room and raise the price of telegraph service 20 per cent all over the United States. They will not submit to it. The Western Union Company said prices had to be increased because it was not making any profits. I have in my pocket the annual report of the Western Union, which shows that from commercial telegraph business alone the company made seven million dollars. It does not take into consideration the leased wires or clock or ticker business, and the dozen other things that go along with its system. One firm here pays $750,000 a year for leased wires. It is too small an item for the Western Union to take into consideration. Why can't telephone companies do that business? Your clients are men who originate telegraph business. Why can't it be done?

I just want to make these little suggestions to get the idea into your minds. I believe the time has come. I believe the American people will rally to a movement emanating from such an aggregation of men as this.

MR. KLINE: The committee on resolutions is ready to report, if the chair is ready to entertain the report.

THE CHAIR (Mr. Gary): Proceed, if there is no objection.

MR. KLINE: The first resolution prepared by the committee I will read:

WHEREAS, James B. Hoge has well and faithfully served the International Independent Telephone Association as president for the past three years, giving freely of his time and means to advance the interests and further the cause of Independent telephony, and

WHEREAS, We fully appreciate his invaluable services to the association; therefore,

Be It Resolved, That this convention tender to James B. Hoge a unanimous vote of thanks for his able services in so successfully organizing and presiding over the destinies of the association for the past three years, and that the secretary of the association is hereby instructed to have a copy of this resolution engrossed and presented to Mr. Hoge as a testimonial to the present as well as to all future generations of the high regard in which he is held by this association.

The resolution was adopted by a rising vote.

The second resolution:

WHEREAS, The Bell Telephone Company is insidiously proposing long distance connection to local Independent telephone companies in various parts of the United States and offering, in consideration of entering into such connection to abandon the local field; and

WHEREAS, It is the sense of this convention that any such connection is bound to injure the Independent telephone cause as a whole; therefore,

Be It Resolved, That this association frowns upon and denounces any affiliation or connection of Independent telephone companies with the Bell Company anywhere on the American continent as being injurious to the people as a whole.

The resolution was adopted.

This resolution was suggested to the committee by certain circumstances which we know nothing about in the east:

WHEREAS, There are difficulties and dissensions arising from an infringement by an Independent company on the territory already occupied and served by another Independent company; and

WHEREAS, Such infringement is injurious to the cause of Independent telephony; therefore,

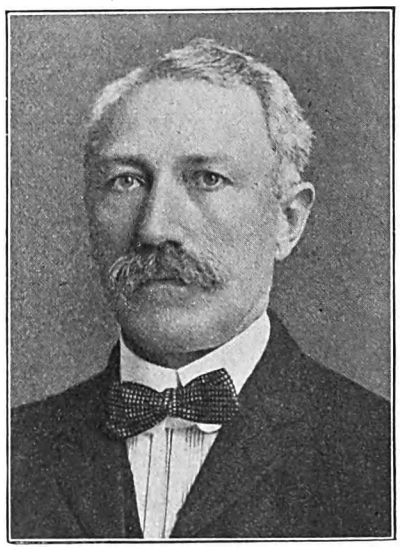
Be It Resolved, As the sense of this convention, that the company on the ground and satisfactorily serving the public shall be entitled to recognition by this association, and any company or individual infringing on the rights of such Independent company shall be repudiated and shall not be admitted to membership in this association.

The resolution was adopted.

PRESIDENT JAMES B. HOGE: Mr. Chairman and Gentlemen of the Convention: I desire to thank you from the bottom of my heart for the resolution that was passed so unanimously here to start with this morning. I want to say to you, gentlemen, that the International Independent Telephone Association will always be most near and dear to my heart. I have spent three years, or practically three years now, in that work. We found a situation three years ago with no organization. We had a divided organization or two organizations, or an attempt at two organizations. My sole object in bringing about a National Association, or attempting to do so, was to get this great aggregation of interests to pull together as a single unit. As I have said to you time and time again, this is no one man's organization. It is your organization. I want to reiterate that at this time, because, gentlemen, I want to tell you that we are a great power in this country, and we want to use that power right. We do not want to use it for political purposes, but we want to use it for benefiting a business that has been created as a matter of necessity. There is scarcely one of us here this morning that fifteen years ago had any idea of going into the telephone business when the patents expired. It had not crossed our minds. Most of us started in because it was a matter of necessity. We had less than 300,000 telephones in the whole United States, and today we have over 7,000,000, and that has been done not by us alone, but by the aid of our subscribers and our hundreds of thousands of stockholders scattered throughout this country; and if we handle our business properly there is no question but what we are going on and will gain in strength from year to year.

The first convention that we had after we made the consolidation here in this city had something less than 300 delegates in attendance. Last year we had 750. This year promises a thousand. And, as some one said yesterday, "Have you noticed the difference in the class of men that attend the convention, the difference in interest, the difference in their age, and all that?" I called his attention to the fact that he must take into account that we are all getting older. Ten years makes quite a difference on all of us, and while we may size up the delegates today as being older in the business or older men, we must take into acocunt that we are all older. We are bringing in younger men underneath to build up, to help along with this work.

Now, gentlemen, in retiring as president of this organization, I only desire to thank you for the assistance you have given me, and for the assistance you have given in building up this organization, because it is through your efforts that this organization has been made a success. I want to bespeak for my successor the same hearty co-operation from each and every one



A. C. Lindemuth.

of you that you have given me. I predict that if that is done—and I have no reason to believe that it will not be done—you will have to get a larger hall inside of two years than this one in order to hold your annual convention. Work your district organizations, your state organizations and your international organization for all there is in it.

President Hoge then returned to the chair.

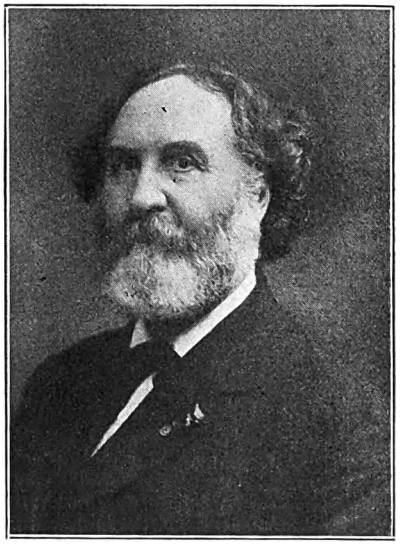
MR. A. C. LINDEMUTH: Mr. President, I desire to supplement the report of the committee on credentials with a few remarks. I am informed by Mr. Harney that his call was made early in the current year and that the call was repeated and renewed as much as six or seven times to the respective associations of the states, territories and provinces which constitute the membership of this association; but that notwithstanding these persistent calls they have not been responded to in accordance with the provisions of the constitution. Now if the matter is simply going to be passed by, the result will be that there will be no legally constituted body; that it will be in the future as it has been in the past. Whether it be by mere neglect on the part of the respective state associations, or whether it be from a misunderstanding as to the proper representation in the International body, or whether it be because they are opposed to the payment of their proportionate share of the expenses of maintaining this organization and are willing to share in its benefits and not assume a proportionate share of the burdens, I do not know; but what I do know from past experience is that as long as the question is not raised, and as long as it is permitted to pass by, the association will have no more regard for the provisions of the constitution than the officers themselves. I believe there is only one way of impress-

ing this upon the members of the association that if they desire to have legal representation in this body they must conform to the provision of the constitution. If the constitution is wrong, then change it and do it in a proper manner. If the assessment is too high, then fix a limit, the major limit, to such an extent that it cannot be oppressive upon the respective minor organizations, but as long as the provisions remain as they are in the constitution, I, for one, am in favor of enforcing them and allowing the respective state, or territorial, or other divisions representation in this body, only in accordance with the number of representative units that they actually pay for. It would surprise you, gentlemen, if you would see the report of the treasurer as to the responses which have been made to these calls for assessments. I think many of you would feel ashamed that you have asked to participate in the proceedings and enjoy the benefits of this association, when you see the utter inequality of the responses to these calls for assessments.

I have, and will furnish the secretary, a list of the states and the amount of money paid in by each. Some have paid in no more than one-tenth of the assessment. The highest, I think, paid by any state association and the nearest approach to the fulfillment of the provisions of the constitution was made by the state of Ohio, which paid one-fourth of one cent per unit, the total assessment being one-half.

Now the committee recommends that all delegates that have been sent here be admitted to the convention, that they be allowed to participate in all its proceedings, but that when the point of order is raised, for the instruction of the chair, he shall rule in accordance with the provisions of the constitution as construed by the committee; that is, that they are entitled to representation only for the number of representative units which they have actually paid for. That representation is figured out and will be furnished to the secretary.

MR. E. B. FISHER: Mr. President, I sympathize thoroughly with the spirit of the report made by the committee on credentials. I feel that the time has arrived when the necessity for financial maintenance of this International organization should be thoroughly impressed upon every association contributing to our membership. I am glad that Mr. Lindemuth, of the Indiana association, as chairman of the committee on credentials, stated just what he did. Doubtless his report was made upon the conditions prior to our assembling here. I have the extreme felicity to say to you this morning that Michigan, with less than 100,000 telephones and mileage, has put five hundred dollars into the treasury of the International association, so that we are clear upon the books and entitled to talk on this topic. I wish you would all do likewise. It is a good feeling. I wish every other president of every other state association could make a similar announcement here. I want you to emphasize in your own minds the righteousness of what Mr. Lindemuth has said. I want it to enter thoroughly into your hearts that the thing to do is to do just as has been suggested. But I want also—voicing the sentiments, I think, of my colleagues of the state of Michigan—that after all this has been said, that we shall have an era of good feeling, go ahead resolved to do better next time, and all vote just as though we had done our duty. I believe that will shame those who have not done their duty more than it would to pin them down, just at this juncture. I should dislike to see any chairman get up and say he had a 1 2-11 vote from his state when he had thirty-five or forty delegates here. I believe there is fairness and justice in what the chairman of the committee has said, but I believe we can get quite as good effect by emphasizing this question and doing the same thing once more. I don't know but what it will bring better response next year than to call attention to the delinquency of some of our neighbors, and as a representative of the only state, as shown up to date, that has done its share—and a little more, I would like to make that suggestion as a practical working rule for the balance of this convention. I believe when we get through our delegations are going to make more generous response in the future than they ever have done before.



E. B. Fisher.

MR. DAVIS: Mr. President, I am in hearty accord with the resolution and the report of this committee. However, you know we do some fighting down in our country. West Virginia must be in the front rank, and we are going to put it there. If we have not a bill of sale for West Virginia, we are going to have it before the convention adjourns today. Perhaps we may have been mistaken in the basis of representation and the amount of money due to the International association. With 23,000 telephones we have contributed $100 to the association, and the company, the West Virginia Western Telephone Company, has obligated itself for $125 for the state association, making a total, when we liquidate today, of $225 for the representation of three delegates in the association and 23,000 telephones. Now, if we are wrong on the basis, the amount of money due the International association, all we ask is that your president, or treasurer, or somebody, indicate the amount of money due from us and we are prepared to give you the money and a bill of sale for it. I hope every other state will show the same disposition to support the International association that West Virginia has. We want to do our part. We recognize the fact that we are not large in the telephone business. We have not got hundreds of thousands of telephones to boast of. We have only got 23,000 in our association, but perhaps 43,000 in the state. We have not membership on the basis of 43,000 but only in the state association. If we owe the International association on the basis of 43,000 telephones we are ready to pay it. And this report, I think, should settle whether we should pay on the actual number of units in the state association or on the basis of the whole number in the state. We are heartily in accord with this resolution.

Upon call for the question the motion was put and carried.

An adjournment was taken until 2 p. m.

The convention met Wednesday afternoon, June 5, 1907, at 2 p. m. pursuant to adjournment; the president in the chair.

THE CHAIR: I will ask Mr. Lichty, of Iowa, to come forward and act as secretary until Mr. Deering comes in. The next thing on the program will be the continuation of the roll call. Illinois is next. Is any one in the room from Illinois?

MR. CHEADLE: I am very glad to report, Mr. Chairman and Gentlemen, that Illinois has had a most successful year during the twelve months that has elapsed since our last meeting. We have in the state an organization now comprising in its actual membership, approximately 100,000 telephones. There are in the state not less than 200,000 Independent telephones, Danville, perhaps, being the only city of any considerable size in the state, outside of the city of Chicago, in which there is not now an efficient, adequate Independent telephone plant furnishing Independent telephone service to its people. The growth during the past year has been not less than 20,000 telephones. Many cities in the state take rank, I think, among the very first cities in the United States in the per cent of Independent telephones to the population. Our state association a few weeks ago, held the largest and best convention ever held in the state. There were 254 enrolled. We had a very unique feature, I think, one that I shall commend to the careful consideration of Independent telephone men generally. We had an enrollment of over fifty of the operators of the state, the young ladies, the women who come into direct personal contact with the patrons of the different companies. We had a most competent instructor, the chief operator of one of the principal cities of the state, Miss Barnes, of Springfield, who conducted a school of instruction for operators, and, besides that, read a very helpful and interesting paper on operating methods. This has received commendation from all over the state as being a most helpful feature. Our purpose was to make it a thoroughly practical convention, to get away from oratory and red fire and skyrockets, and get right down to business. That we were measurably successful I think is conceded by all who were present.

I may say further that Illinois has not, during the past year, been seriously interested in questions relating to the Bell Telephone Company. There is no hobnobbing with the Bell. We have sublicensee companies, but the rank and file of Independent companies are Independent in the fullest sense of the term. We have not been seriously considering toll line contracts or working agreements of any kind with the Bell Telephone Com-

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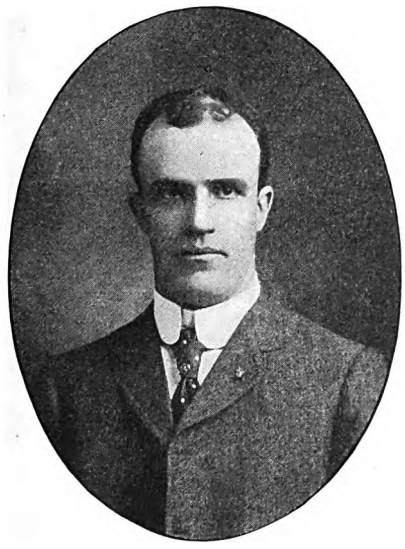
pany. The spirit of independence is abroad in the state and the Independent people generally are in a hopeful frame of mind and are more enthusiastic and have greater and more permanent and substantial belief in the absolute justice of their position and the ultimate success of the cause.

MR. CHARLES C. DEERING: Iowa's Independent telephone business is growing. Our exchanges are increasing in size, both our rural and city subscribers are increasing in numbers and new toll lines are being built. Our toll lines are very largely local in character, but longer distance lines are being built and the toll line situation in our state is improving. We have no large centers of population, and the Independent field, as many of you know, is covered by a very large number of small companies. There are a great number of farmers' mutual companies. Last year 2,500 companies reported to the state for taxation. Many of these, of course, were very small companies. The number



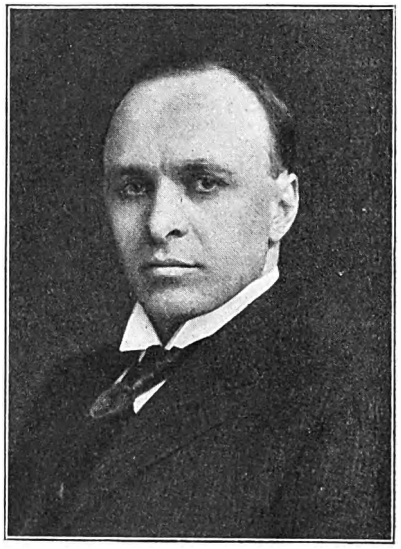
Chas. C. Deering.

was so large that it has been suggested that perhaps every telephone user in Iowa must be his own telephone company. Our state association has had a good growth and will continue to grow. Many of the small companies have not been interested in the association work in the past, but as time goes on, more and more of them will find it to their interest to join hands with us. We have had a state agent in the field for the past year, and his work has brought good results both to association and non-association members. We feel that the work carried on by the International association is of general benefit to the cause, and we are especially anxious to see the campaign of publicity planned by the International association carried out. Owing to the large number of small companies, not members of our association, our association membership is not as large compared to the total number of telephones in use as in many other states. We have 70,000 units represented in our association. At the time of the last assessment by the International association, our paying membership was a little less than 60,000 units, and on that we paid to the International association the sum of $293, which at the time we figured, paid us up at the rate of one-half cent per unit.

MR. M. B. OVERLY: Mr. Chairman and Gentlemen, our secretary handed in a written report, but I do not see him, so I will give a short verbal report.

Last year we came to the International convention with a brand-new organization. About twenty-seven of us had gotten together and reorganized the association of Kentucky just in time to get to the International convention with about three or four representatives. Since that time we have gotten into our association practically all of the Independent companies of the state, and we held a state association meeting in April, which we consider was one of the best state association meetings that was held this year. Some of us from Kentucky have attended various other state association meetings and we do not take off our hat to any of them. We had present about 150 operators, and you know one man in Kentucky represents enough energy to equal three or four in Ohio. We have at this convention about twenty-five people, which we consider is a very good representation, not only for us, but for those who attend, because we believe that a man attending these conventions can not go home feeling otherwise than it has been a good thing for him to be here, and he will be able to do better work when he gets back.

We have, in round numbers, 50,000 Independent telephones and about the same number of Bell. The Bell has a great many of those, however, in the neck of Kentucky running up to Cincinnati, where the Independents have none at all. The state is being very well covered. The western section, west of Louisville, is practically all filled and the northern part, east of Louisville, is practically all filled. The companies are all in good shape; practically all going ahead and developing their plants, and are doing well. The toll lines are being extended every day. More lines are being built and in new sections. There are a number of counties in the southern section, especially in the southeast section, which have not been developed to any great extent, but at the present time there is a great deal of building going on down there on account of the development of the natural resources. The coal, iron, timber and all that sort of thing is making it necessary for them to have telephones. Many of those counties have never before had any telephones of any kind, but the Independents are getting in.



M. B. Overly.

MR. E. B. FISHER: Mr. President, Michigan has been right busy and so has no written report. We have, however, a fair measure of progress to report as to the state. At our state convention in March, a telephone organization was perfected in better form than ever before. We have a salaried secretary now, who has some opportunity to get about the state, and we have set about getting absolutely accurate statistics from the entire state. We have some 428 exchanges in the southern peninsular and 661 toll exchanges, or points, besides those exchanges, making 1,089 accessible points for toll service. We have reports as to the number of units in service from about 300 of those exchanges and about 419 of the toll points. We have no definite information as to the upper peninsula, as they are more largely affiliated in their telephone relations with their neighbors in Wisconsin than they are with the southern peninsula of the state. However, we have this progress to report, that for the first time a definite representation is present in this convention from the upper peninsula of Michigan, Mr. Ludington, the general superintendent of the Marquette county system being here. They have between 3,000 and 3,500 telephones in that peninsula and hope to double it by the time of the next convention, as they are making progress.

We have from the companies reported definitely a little over 70,000 telephones. Our theory is that there are somewhere in the neighborhood of 90,000 telephones in the entire state, perhaps a trifle short of that. The 128 exchanges that have not reported to our secretary yet, notwithstanding numerous letters of inquiry and persistent urging for reports, will bring the number to nearly that. We have a little over 9,000 miles of the long distance lines, of which a trifle more than half is already of copper. That includes a great deal of work that is scattered through some rural and some mutual service, but is really connected with the long distance system of the state. The most considerable element of progress, however, in our state, lies in the fact that the city of Detroit is building an Independent system. The Detroit home plant is building and will be in service this fall. It has over 12.000 telephones contracted for already, verified contracts. and the number is increasing very rapidly. In addition to that. it has organized a company known as the Interstate Long Distance Company, which will use about $1,500,000 in the construction of long distance lines. A very definite and complete program has been entered upon, so that we will soon be equipped with copper long distance lines through the entire state. The Home Telephone Company is taking care of

the towns and hamlets near by, and it will extend service into the adjoining states of Ohio and Indiana, which will more closely unite us with our neighbors in the south. The long distance lines in the western part of the state will give us connection with the state of Indiana, and we hope ultimately with this city. That is a part of the work that is planned for now.

One of the most signficant things in connection with the development of Detroit is this: The sale of the so-called Independent plants some years ago left a lot of bad feeling among men who might invest money in telephone securities, and men lost money who had put their investments into the old Independent plant. The Michigan Bell Telephone Company failed entirely, went to the wall, and was sold out; and in the reorganization three million dollars of floating indebtedness that that company had, never was paid, and its stock was wiped out entirely. That sort of condition did not conduce to good reputation for telephone securities in the city of Detroit, where formerly some of the most important business interests of the city had been identified with the Bell movement. For instance, the late Senator McMillan of our state, a man of several millions, a man of large influence and business affairs, was at the head of the Michigan State Telephone, or, rather, Michigan Telephone & Telegraph Company, as it was known. Men of that kind had been identified with it, so when other men went into the telephone movement they went into competition, if you please, with some of the very strongest men, financially and politically, there were in Michigan, and the failure of the Independent movement in part, as indicated, gave it a black eye. It was really heroic of the people who went to Detroit to go there with the proposition of spending some millions of money under those conditions; but they are not only doing that, but they have induced some of the very strongest business men in that city of Detroit to become colaborers with them. They have placed a very large block of the securities with men who are leaders in the same sense that Senator McMillan was some years ago in the Bell Company. To have secured the financial cooperation of men of that character in our state has been as important an achievement as we could possibly report, for us in Michigan and for you too, because those men are strong business men, and they have been persuaded that good, strong, Independent propositions are good places for investment. In that sense of the word, this past year has been the most significant, the most satisfactory, in the state of Michigan that we have had. Our hopes to get connection with Chicago are increased and service with the state south of us, especially with Detroit, has given us the very heartiest encouragement. So when emissaries of the competitor came around and made us propositions like unto those that have recently been made in the states of Ohio and Indiana, where they were sat upon, as you will remember, in Indiana so effectively, we said, "Go to! We stand pat." We are still standing pat in Michigan.

The Chair: It has been suggested that inasmuch as we have just reached Indiana on the roll call of states, it would be well to take up Mr. Norton's paper which is scheduled for tomorrow morning, on "The Indiana Situation." Will the convention listen to Mr. Norton's paper at this moment? If there is no objection, then, Mr. Norton will read his paper at this time.

Mr. Norton then read his paper, which was received with applause. It appears elsewhere in this issue of Sound Waves.

Mr. Frank L. Beam: Ohio is probably one of the best developed states in the Union, telephonically. We have eighty-eight counties in the state and every county is developed with the exception of one, and that is Hamilton county. We make up our report by counties and make a comparison, so that we can see just how strong we are in each county in the state. I will simply give you the aggregate.

This statement was made for our annual convention on the 28th of March, this year.

The Independents had 290,400 telephones in service against the opposition 145,956. That is including the telephones that they have in operation in Hancock county, where there is no competition. We have 845 exchanges against their 277. We have 1,723 toll stations against 861. We have 25,311 stockholders. We made a growth for the year from April 1, 1906, to April 1, 1907, of 42,096 telephones. In 1896 there were fewer than 45,000 telephones in service in Ohio. The reports show that there were about 294,000 telephones in the United States in 1896. Today we have operating in Ohio, by the Independents, as many telephones as the opposition had in the entire United States in 1896. We are making a growth each year—we have for the past three years in Ohio—of as many telephones per year as the opposition installed in the eighteen years of their exclusive occupancy. I think this probably is due to the very thorough organization we have in the state. The first organization in Ohio was made on April 29, 1894. At that time there was only one or two exchanges in the state. The National Association, I think, was organized in 1897 in Detroit. We were organized probably three years before.

There is one thing that we do down in Ohio that creates a great deal of enthusiasm among the stockholders. I find that there are a great many of the Independent companies throughout the state who, when they have their annual meeting for the officers to make their report, instead of having only a handful or probably the directors to hear the report, make a special effort to have every stockholder present to know the condition of the company and also what is doing in the adjoining counties and in the state and in the Union. They give a banquet. I know in my own town—excuse me for referring to that—we have 290 stockholders, and we had our annual meeting in April and we had over 200 of the stockholders come in to hear the

Frank L. Beam.

report and to attend the banquet. You people who have been raised in the country and are old enough to remember the time when we had county fairs or a circus know how you looked forward to that day. It was a holiday for you, and our stockholders down in Ohio are looking forward to the time that they are going to have the annual meeting, as they consider it a holiday, and they put on their good and glad apparel and come in to hear the report and partake of refreshment.

The Chair: Gentlemen, Mr. Brailey, of the United States Telephone Company and some of the Indiana interests, is with us, and was expected to appear on the program tomorrow, but unfortunately he has to leave inside of the next hour, and with your permission I will call on Mr. Brailey at this time.

Mr. James S. Brailey: Mr. President and Gentlemen of the Convention: I would not have taken the liberty to ask the president to call upon me out of the regular order today and would not have addressed you at all, as I am compelled to be away tomorrow, but for the fact that last Saturday when I arrived home from St. Louis I received an anonymous letter, which is postmarked Columbus, Ohio, stating that if I dared to address the telephone convention in Chicago on the subject, "The Strength of the Chain," the party who wrote the letter would be here and show me up as a fraud and other dire announcements. I am here and that is the reason I am addressing you now. If the gentleman is present, I should like to have him make himself known. I hardly think it is a member of our association.

Now, I will, with your permission, proceed with my address, "The Strength of the Chain."

The strength of the chain in the Independent telephone movement represented by our association is our organization. The chain represents the business of the Independent telephone companies in this association and in this United States, and the strength, the foundation of that organization of the Independent telephone business is our organization. Every link in the chain, every part of the chain, the strength of it is organization. Our organization, representing the Independent telephone interests of this country, to my mind represents two principal ideas. The first idea is the protection of our own business and the protection of the business of the members of this association and what they represent. During the time that the Independent telephone movement has been in existence we have had some sort of an organization—not always the perfect organization which we have today and have had for the last three years, but we have always had some sort of an organization, and to those various organizations which we have had, has been due the defending of the patent suits brought by the Bell Telephone Company, has been due the advertising and the making public the success of the Independent telephone movement; and, in fact, the reason that

we have Independent telephone properties in this country today and are able to accomplish and do things, is because we have always had some sort of an organization. While I represent one or two fairly large companies, those companies, gentlemen, without organization, without you, without all of the others gathered together in our state organization and in this wonderful International organization, would amount to practically nothing. What is one little railroad system in this country today? Does it cut any figure? Does it amount to anything? Nothing whatever, unless it is linked up and tied up by organization with some other larger and more extensive system. I do not care what the business is, but especially in our business, where we only have one common opponent and where that common opponent instead of being in only one state covers the entire United States, our very existence, the very value of our various properties, depends upon our organization.

One of the duties, gentlemen, and I believe the first duty of this organization is to defend the Independent telephone business and defend each and every interest of each and every state organization and each and every company represented in the association. I believe that the second duty of this organization is to promote the telephone business. After all, while we have competitors in the telephone business, we owe a duty through this organization to present and to protect the business which we are interested in. There are three hundreds of millions of dollars represented by this association invested in the telephone business. I believe it to be the duty of this association, the duty of every state association and every member of this association, at all times, in every way, to do everything possible to help and assist in advertising and upbuilding the telephone business.

We are in the best business on earth, the best business as relates to public service corporations. Make your friends—your professional friends, your banker friends, your lawyer friends, your farmer friends, all understand what a wonderful business this is that we are engaged in.

You know the telephone has grown upon the American people to such an extent that, not taking into consideration its benefits from a business standpoint, it has become a telephone habit, just the same as the American people have got the coffee habit. You know that if hard times came along a man might go without eggs or ham for breakfast, but he would never go without coffee; and so it is a telephone user may go without electric lights or gas or walk down town, but he will never go without his telephone.

It is these facts that we want to make known to everybody, and I think it should be a cardinal point of this association to devote time and energy to advertising the telephone business. And I think the time is past, we are too big, we are too immense, to consider knocking anybody else's telephone business.

Gentlemen, for the past several years it has been reported on the best authority—I think it has never been denied—that our opponent company has expended in publicity, through papers and other sources, $500,000 a year, and I am sorry to say that very little of that money was spent in advertising the telephone business. It was foolish to divert such a fund in attacking Independents.

So let us not as individuals, let us not as an Association, let us not as telephone people, attack the telephone business, but let us boom the telephone business and let the public, the professional world and the bankers understand what a wonderful business this is. There is no business that has the solid foundation that our business has. In making these references I am talking about business and corporations that serve the public. We see the railroads attacked. We see the various lines of other public service corporations attacked. Every street railroad company and gas company is attacked. We see the papers filled with attacks upon these various corporations, but we never see any attacks upon the telephone business or the telephone companies. The people like the telephone business. The people are with the telephone companies, when they do their business upon a just basis, and our companies are doing business upon that basis.

This telephone habit, the success of our properties from the financial standpoint, the money we have made, the increase in value of our properties, the dividends we have paid, the dividends all the companies we know about have paid, should be told to everybody. If any one asks you why any one else bought any other telephone company, never knock it. Give it a good, straight send-off. Of course, there are some exceptions, and I don't mean to say we should back up and stand behind a mismanaged plant. but there are so few of them that they hardly need attention.

I think it has been shown that there is not a business in this country that shows a smaller percentage of failures than the telephone business. Why, you all know how thoroughly the public is becoming educated to the use of the telephone, what a thorough hold the telephone has on the public, and how much of a hold it is going to have on the public five or ten years from today.

I want to tell you, after ten years' study, I don't know any business that I would as soon have my money in as the telephone business. What money I make in the future I am going to put into the telephone business. I am not going to put it in anything else, because I know this business is good and I am going to advertise it to everyone I know, and I think this association and every member of the association should continuously, by day, by night, and at all times, advertise the telephone business, and in that way strengthen the general Independent telephone interests.

MR. A. L. TETU: Mr. Chairman and Gentlemen of the Convention: I can give you but little information about Oregon from the fact that I am not yet in the responsible position of taking care of property in that country. I have made a trip to Portland, and I have become possessed of enough data, I think, to convince you that if there is any possibility of Mr. Brailey's idea of the telephone business being the best business on earth that that possibility is presented upon the Pacific Coast, and with especial reference to that part of the coast in which I expect to be located.

We are now ready to give service in the city of Portland. We are about to build in the city of Salem. We are building in Oregon City, Albany and towns located in the Willamette Valley. The same interests, if you please—allied interests, at least—are constructing plants in Tacoma—about ready to operate; are building in Spokane, Walla Walla and Bellingham, and through the Puget Sound territory; have already constructed five copper circuits between Salem and Portland, Tacoma and Seattle, and are engaged in the construction of the gap between Portland and Tacoma, upon the completion of which they will have five circuits where I now understand the Bell company has but one.

I think, Mr. Chairman, that is about all that needs to be said at this time of the conditions on the Pacific coast, but I hope, gentlemen, that by the time the next convention rolls around, and if I have the honor of being the Oregon representative, to tell you a story of which my sponsors need not be ashamed.

The vice-president, Mr. Charles E. Sumner, then took the chair.

THE CHAIR: Does Mr. S. C. Thayer, of Beaver Valley, wish to make a report?

MR. THAYER: Mr. Chairman and Gentlemen of the Convention: I represent a little piece of territory that all men who live in eastern Ohio and western Pennsylvania have been and will be much interested in. I would say a word here, too, for the benefit of California, if it had not been for our people nearer by, although I wanted you all to know—but time is short and men are long-winded, some of them; I hope not to be.

This little piece of territory which I represent lies in what is known as Beaver Valley, along the Ohio river and the Beaver river, where the Beaver river empties into the Ohio, twenty-five miles down the Ohio river from Pittsburg. Seven years ago, when I was engaged in Columbiana county, Ohio, building, a party came to me and desired help in the Beaver valley. He said they needed telephone service; they needed help; they had no telephone men there. In fact, at that day, there were not very many Independent telephone men. I took him to Cleveland to see if somebody could not be scared up. I turned him over to the president of our company, and he tried to get him somebody, but he didn't get anybody. He went home, and the Bell company just simply bought every county in the valley, so to speak. That is, they bought a majority of it, and they turned him down and they kept him down, and a year later another company was organized and they picked it up and they were turned down, and a year later the same thing happened again, and so on. The Bell Telephone Company has been able to keep that little piece of territory up to the present time. Now Columbiana county, Ashtabula county, all those counties, and our counties in Pennsylvania adjoining are suffering; they have suffered; they need that valley and the Bell people know it. It is the key to the situation. I will say that in my judgment it is the most profitable, prettiest piece of telephone territory in the state of Pennsylvania. The Bell Telephone Company boasts that Beaver, Pa., gives the greatest revenue of any place of its size in the whole world, to say nothing of the state of Pennsylvania.

Two years and a half ago I got free from another situation which I held over east and resolved to go down there and live with the Bell Telephone Company. I asked for those franchises and told those people that I was not there to buy them; I would not give five cents for all the telephone franchises in the valley, but that I was going to have them. They laughed at me, and they turned me down, and I took it up the next day. They turned me down again. I took it up the next day and I got it in Beaver Falls, and the burgess vetoed it. That was my

success in Beaver Falls. I took it up the next day and I caught those fellows napping. Then I got it. I had them where the dog had the woodchuck. Then I got my franchise from Beaver Falls and I went immediately to putting in underground conduit; went right to work. That showed the rest of the towns what we intended to do. I applied for the rest of the franchises and got Brighton and got Beaver, and last week I got the Rochester franchise. I have got the last franchise in the valley and by January 1, 1908, you will see a telephone system just as good as can be made in Beaver valley.

Now while I am on my feet I want to speak about how we are organized there and just what we are doing. Seven or eight years ago we did not know as much about the telephone situation as we do today. Our company is organized and capitalized at $300,000 and it is now raising its capital stock to $500,000, $200,000 of it to lie dormant in the treasury as treasury stock and bonds for extensions. The citizens of the valley own the entire stock. Every subscriber has an opportunity to become a stockholder, and they are becoming stockholders. We have about 150 stockholders. Every month we have a stockholders' meeting. Each one of them becomes a committee unto himself and goes out and brings in another subscriber.

THE CHAIR: There is a resolution on the desk, which has been approved by the committee on resolutions. I will ask the assistant secretary to read it:

WHEREAS, The Independent telephone journals of the country have rendered the cause of Independent telephony invaluable service during its existence, and are constantly placing before the public the whole truth in regard to the movement, and

WHEREAS, We fully appreciate the great work they are constantly engaged in; therefore,

Be It Resolved, That this convention extend to them hearty thanks for their past efforts, and in order to encourage further efforts recommend that the rank and file in the Independent telephone field support them loyally by patronage and subscription.

This resolution was presented and moved for adoption by D. A. Walker, of Columbus, Ohio; seconded by Edward E. Clement, Washington, D. C.

The motion was put and carried.

THE CHAIR: We have now reached the point on the program for "Compulsory Interconnection of Bell and Independents," to be led by Mr. J. B. Earle, of Waco, Tex.

MR. EARLE: Gentlemen: Compulsory connection between the Independent and Bell interests in our state has never been agitated before the people or before the legislature as it has been in other states, but in our state it was slipped into the Democratic platform, and so was taken up by the legislature, and not by any desire of either the Independent or Bell companies.

Mr. Earle then read a paper on this subject, which was received with applause. It will be printed in a subsequent edition of SOUND WAVES.

MR. J. WALTER BARNES: Mr. President and members of the convention: Some few weeks ago I received a letter asking me to give a brief talk upon this subject. I don't know why, unless it is because last February I received a telegram asking me to go to Raleigh, N. C., to assist in some telephone legislation then pending in that state. When I reached Raleigh I found the manager of the Raleigh Telephone Company, Mr. Wynne, and with him began an investigation of the pending telephone legislation and also some contemplated legislation. I found upon investigation that the chairman of the committee on public service corporations lived in a town where the Bell had recently sublicensed an Independent company, but there was one little connecting Independent company that refused to enter into this mesalliance and held out to the end, and installed a pay station in the town in which the said chairman lived. It so happened that this little Independent line connected with the town in which the aforesaid chairman formerly resided and where he had considerable business. It was necessary for him to go to the pay station in order to get connection with the city of his nativity; hence he conceived the idea of compelling this little Independent telephone company to connect with the Bell Company in the city in which he resided and assisting in maintaining therein a joint agency to check all messages going over the lines between the two companies. This was the first provision of his bill—the maintaining of a joint agency. Of course the absurdity of this is apparent to everybody when we think of a joint agent in a town with one little pay station and having one person check all the messages.

To maintain a joint agent would make additional expense such that the little Independent company could not afford to pay. It would be much better indeed for it to abandon the station than attempt such a thing. The result in this town would have been that the Bell sublicensee would of course obtain all the business, practically, and thus drive out the little Independent company and keep it from developing and building an exchange in this city. It would give the Bell monopoly entire control of business; competition would be destroyed and the sublicensee would render such service and charge such rates as it desired. It has been demonstrated time and again that competition is the life of trade, and so it is the life of the telephone business. One company is apt to become arrogant in its demeanor and exorbitant in its rates if left to itself. The result is always to the disadvantage of the subscriber, in that he had very much fewer telephones over which to reach people if there be but one company. In other words, my opinion is that a compulsory connection would eliminate one company from the local field and thus result in the confiscation of property. No extension of lines would give the Bell all local points. It does not want to take care of farmers and small towns in our territory, for it claims that these are operated at a loss.

One of the arguments advanced for this physical connection of telephones is that the railroad companies are compelled to connect. They are on an entirely different basis. In the railroad business the motive power department of the company receiving the car takes charge, in connection with its own means of hauling all its load, while in the telephone business all connections would be made and the instruments used would be of the opposing company and the lines used would be those of the opposing company. The service would be just what the company receiving the message would desire to give. In other words, if the Independent company were to use the toll lines of the Bell it would hear that the lines were busy or in trouble, and it would be impossible for the Independent companies to do business over these lines, and vice versa.

The chain is no stronger than its weakest link, so that this compulsory connection, it seems to me, is weak in two particulars. First, there could be no arrangement between operating companies of such character as to be mutually satisfactory to each company, and good service would require that all operating rules should be alike and that there should be some central authority responsible for defects in operation, and this would require the apparatus to be of such a type as to give the best service. In fact, to compel two opposing companies to connect would be a farce. It is unnatural to expect that any company would give its best service to its competitor. Even as it is, we know that those of us who have connections with smaller companies, where they go off on ground lines, hear our subscribers complaining of the service at these points and oftentimes the line and company is condemned because of this fact. "Why," they say, "the service is no good. I tried to talk to such and such a point and it was no good." With all the effort we can make it is difficult to obtain good service in certain sections. Then, too, one company would seek to injure the other by saying that the trouble was occasioned by their defective apparatus; that they didn't have good lines; didn't have good instruments, and therefore they could not get good service.

Second, it would retard the development of the telephone business. No Independent operator, or Bell either, for that matter, would put money in a town in the building up of a telephone business in which there was already an operating company if it thought compulsory connection would obtain and that their competitor would have advantage of their expensive development, for it would amount to practically confiscation of their property.

I do not believe that in all cases those who have introduced these bills have had merely some private interest to move them, but think that the desire to promote the public welfare has in many instances caused legislators to introduce these bills thinking that the people were anxious for the connection and would benefit by it. Indeed, one member of the North Carolina legislature thought that it would be doing the Independent telephone companies a great favor by giving them the benefit of the Bell long distance lines. It did not take long, however, to convince him that this would not be the case, and Mr. Wynne, who is a baseball man, pitched into them in a good battle and succeeded in defeating all that legislation, so that North Carolina, while not very large in an Independent way, was effective in defeating the legislation that they attempted to force upon the Independent companies, and the result is an impetus in that state in the Independent movement.

To summarize, it seems to me on the operating side we would have these objetcions to it: It would be poor service; physical connection would be defective; the checking of accounts and the maintaining of a joint agent would be against the operating side.

On the investment side, it seems to me it would result in the confiscation of property; it would retard development; it would promote parasitic small companies; it would result in loss of revenue in a great many places where they had invested capital, and the trouble in enforcing the payment of bills and making contracts with adjoining companies would also come in.

MR. W. A. WYNNE: Everybody knows that an Independent telephone man who wants compulsory connection with the Bell Telephone Company is worse than the elevator service in this hotel. It should never be tolerated.

MR. E. B. FISHER: Mr. President, it is necessary that the members of this International association should realize that this compulsory connection proposition is a vital matter today. There is hardly a legislature in the United States that has not had some such measure introduced. We had two such measures introduced in Michigan this winter. Our legislature is still in session. It was necessary to go down there with a campaign of education. In Ohio, the attorney general of the state came out in a signed interview in one of the papers, urging the legislature at its next session to pass a law for the compulsory exchange of long distance service, not local exchange service, but long distance. It is absolutely necessary that we shall have the facts of our different states so that we may be able to tell our people what has been done and what has not been done in other localities. We should not go away from these papers and from this discussion without pretty thoroughly understanding that it is a vital matter for us, and we need all the information we can gather. We should disseminate this information to our neighbors.

Each of us should exchange our views. That is what our association is for. If any such measure comes up in our locality we want to be able to ask friends who will send us information that will help us defeat such legislation in our localities. We want to keep our eyes open for the telephone journals, and help each other all we can.

We want to look at these chances and be ready, so that if in our respective states there shall be talk of compulsory connection we shall be able to combat it. All we will have to do is what we did in Michigan, with the help of Texas, bring the matter to the attention of the legislature, and we will win every time. In the state of Michigan we have 15,000 Independent stockholders. They have 25,000 in the state of Ohio. Those people exert a tremendous influence on the legislature when the facts are known. We must go home with the idea that this compulsory connection is a possibility unless we are eternally vigilant.

MR. W. J. PLAISTER: Mr. Chairman, I think the gentleman from Michigan has the right idea about this matter, and that we have got to look it right square in the face. My own company operates in southwestern Kansas. Our toll line reaches within two miles of Oklahoma. I picked up only three days ago a copy of the constitution that that territory has prepared and upon which it will vote in a few weeks to become one of the states of this Union, and one of the very first things I saw was a section in the corporation act of the constitution—not in the law, in the constitution, where it is going to stay and is going to be the law of the land—that provides that every telegraph company and every telephone company shall receive messages from every other telegraph company and every other telephone company, and that they shall make physical connection for switchboards in such manner as the corporation board may direct. That constitution will probably be adopted in Oklahoma. I don't know what the president will do with it. I know what I would do with it if I were president; I would turn it down, because it has more tomfoolery in it than any constitution in the United States. But that section got into that constitution for the very same reason that Mr. Earle says that the bill was introduced in Texas. It is part of the Democratic platform of Oklahoma, and there was a constitutional convention with 100 Democrats and twelve Republicans, and they had to put that in there, because that constitution is to be the Democratic platform on which the state election is to be held this fall. There is no reason under the heavens for it in Oklahoma, because the Pioneer Telephone & Telegraph Company is a Bell institution and there is not an Independent telephone company of any consequence in Oklahoma at this time. It is all Bell. It is put there simply because somebody aspired to make political capital.

Now the thing I would like to have discussed at this meeting is, what are we going to do about it?

Mr. Sumner took the chair.

MR. KLINE: There is only one thing that I think is going to cover this trouble. Build your long distance lines, build your local exchanges, to all these points. It is the only thing that is going to cure it. I remember in 1897, when we started in the telephone business, we built three exchanges in the state of Pennsylvania, and we very seriously discussed the constitution question and the law as to whether we could not compel the Bell companies to give us connection. We wanted it, then. We had no long distance lines. We have since then gone on and built our long distance lines. The only way I can see to cure this is to build the towns and the lines and the thing will die out of itself.

THE CHAIR: Gentlemen, if there is no further discussion, I wish to say before adjournment that the president requests all to be in the hall promptly at 10 o'clock tomorrow morning. Tomorrow is the last day of the convention. There is a great deal of business to transact, and it is hoped that all will be present.

The convention met in its fourth session, Thursday morning, pursuant to adjournment, the president in the chair.

THE CHAIR: There are three or four papers on yesterday's program that were carried over. One of them was "Where Copper Comes From," Mr. J. S. Haley of Livingston, Mont.

Mr. Haley then read his paper, which is printed elsewhere in this issue.

MR. E. E. CLEMENT: Mr. President and Gentlemen: In submitting the report on "Physical Standards," I want to say that the committee has been at work for several days and has covered quite a wide field in its considerations and deliberations. The report itself is necessarily somewhat brief, but we have endeavored to present the result of our consideration in a concrete form, and I hope there will be some discussion afterward that will bring out more than we have felt it necessary to put into the formal paper. The committee went at some length into the question of ways and means, but did not feel that it was well to make specific recommendations as to ways and means.

It was moved and seconded that the report be received and placed on file.

MR. WOODBURY: At a meeting of the executive committee, held at Indianapolis, May 15, Mr. Hoge reported that there would be on June 1 a deficit of approximately $5,800, and that he had exhausted the means in his power to provide that amount. After some discussion and a series of meetings, it was decided to confer with the manufacturers and publishers and supply people with a view of financing this debt. To this end a committee was formed, consisting of E. L. Barber, C. Y. McVey and W. B. Woodbury, the first three representing the operating companies, H. B. McMeal and W. H. McDonough, representing the publishers, and J. G. Ihmsen and W. E. Doolittle, representing the manufacturers. This committee started in at once, raising the necessary amount, and solicited contributions from operators, supply dealers and publishers. The result is that the committee has turned over to Mr. Splane, the treasurer, $6,705, which is $905 over and above the deficit. They have handed to him a list of pledges amounting to $1,775, which the committee has every reason to believe will be paid. I do not think there is any doubt but what we will realize that amount.

In giving this report the committee wishes to acknowledge with a great deal of gratitude, the very liberal and generous response that they received from the supply people, manufacturers and publishers and everybody else that they went after.

THE CHAIR: You have heard this report, gentlemen, what is your pleasure?

MR. A. L. TETU: Mr. President, I move that the thanks of the International Independent Telephone Association be expressed to the gentlemen whose names are contained in the report just given.

The motion was seconded (members rise).

THE CHAIR: There is a committee to report at this time, with reference to changes in the constitution and by-laws.

MR. DAVIS: On behalf of the chairman, Mr. Beam, I submit this report and want to make a few remarks in support of the motion.

Now, Mr. President, your committee has spent considerable time in deliberating on this subject. We find that it involves too deep a proposition to take up in the short space of time given this committee. Your committee believes it is the proper thing to incorporate the association, and I think that it can be done by getting it incorporated under the laws of some state favorable to our association.

As to the matter of creating sections, or different divisions, we feel that it is the proper thing to refer that to the executive committee. It will require time to work it out, and we have safeguarded the interests of the operating companies, inasmuch as we have provided that the various sections shall not be entitled to a representation to exceed one-third of the delegates seated at any convention. There was no feeling of opposition toward the manufacturers and supply dealers. We believe that they should be represented in this association.

I offer the resolution in behalf of the committee and move its adoption. The motion was put and carried.

MR. WOOD: I move that the report be referred to the committee on constitution, with instruction to make the necessary changes in the constitution to carry it into effect. There will have to be some minor changes made before it can be carried into effect. The motion was seconded and carried.

THE CHAIR: We have a number of papers now, gentlemen, that have been sent in by those who are on the program, but who could not be present. I will ask the assistant secretary to read the title of the paper and by whom, and then if you wish

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to hear them read, you can make a motion and refer them—accept them, or do as you think best.

MR. HARNEY: "Independent Telephone Securities as an Investment," by W. L. Moellering, Fort Wayne, Ind.

A MEMBER: I move that that paper be read.

THE CHAIR: There being no objection, we will proceed to read that paper. The paper was read by Mr. Harney. Its full text appears in this issue of SOUND WAVES under the caption, "Convention Papers."

THE CHAIR: The next paper is "Making History in the Canadian Northwest," by Mr. Dagger of Winnipeg.

Mr. Francis Dagger of Winnipeg, Manitoba, then read his paper, which was received with loud and continued applause. This excellent address may be found in this issue of SOUND WAVES.

THE CHAIR: You have heard the reading of this very excellent report, gentlemen. If there is no objection it will be accepted and filed. This morning we called on Mr. Sumner for his paper on the "Postoffice Situation." I see he is here now.

MR. CHARLES E. SUMNER: I realize the hour is getting late and I will take but little of your time.

You are all aware of the fact that in 1903 the postmaster general issued an order which provided that the postoffices of the United States should subscribe for but one telephone and they should subscribe for that telephone which would enable them to have connection with the postoffice at Washington. The Independent companies throughout the United States were greatly handicapped, and they felt that this was a great in-

Charles E. Sumner.

justice to them, especially in cities like Toledo, for example, where the home company had 12,000 telephones and the Bell 4,000. There the great majority of telephone users were deprived of the privilege of telephoning to the city postoffice.

But I understand that order has recently been rescinded. Prior to the rescinding of the order several gentlemen prominently interested in Independent telephony have been applying for a franchise to install an Independent system in the city of Washington. The preliminary work covered a period of about two years. They were practically ready to introduce a bill at the last session of Congress, but the session being a short one and the congress being overwhelmed with work, they thought it would be inexpedient to at that time introduce the bill; but I will say that early in the next session a bill will be introduced for a franchise to install a system in the capital of the nation. It seems that the time was never so opportune for that purpose as the present. Independent telephony throughout the United States is very strong, and we have our exchanges all over this country furnishing good service, and we have the beneficent effect of competition as a good illustration of the establishment of Independent telephony. In addition to that there is a growing sentiment, as you all know, against monopoly in general, and what is fully as strong and as favorable, the President of the United States believes in a square deal and equal opportunities for all. Such a bill, gentlemen, if introduced, or when introduced, as it will be, will be referred to the committee of the District of Columbia. Heretofore we have thought that we were not in a position to receive the most careful consideration at the hands of that committee; but I am advised that the committee of the District of Columbia, as it will be constituted during the next session of Congress, will be such as to give us a very careful consideration and a very full and fair hearing. Some of the members of the committee I think are not enamored with the service that the Bell Company is giving at Washington. During the last session several resolutions were introduced by the members of that committee calling for an investigation of the rates and the service of the company operating in that city. The session, as I said, was short, and there was so much business it could not be taken up at that time, but I am assured by that committee that the matter will be taken up early in Congress, and I know and we all know that the Bell service and methods will not stand investigation.

Now, gentlemen, I think the influences which perhaps are more powerful than all that I have named, are the organizations of Independent telephone men throughout the United States. This association, gentlemen, can render great and efficient service in procuring a franchise in the capital city of the nation, and I am sure that you all feel that the development of the Independent telephone requires that the system shall be established there. It requires that we have some official recognition on the part of the government, and I know of nothing that would be of more assistance to us, or of greater advantage to us, than the installation of an up-to-date system in the city of Washington.

Of course, gentlemen, you and the people whom you represent are in close touch with the people of the United States. You represent many investors; you represent many patrons who are delighted with the service which you have furnished them, and if we can rely, as I believe we can, upon the hearty co-operation of the president and the manager and the board of directors and the investors in Independent securities throughout the United States, and if we can ask you gentlemen to exert your influence along the lines of proper political activity, bringing influence to bear upon your representative and your senator, I believe that the prize is within sight, and that the next session of congress, if we will put our shoulder to the wheel and help along the fight, will grant us a franchise which will enable us to install such a system in the city of Washington. During the summer and fall it is quite probable that you will receive communication asking for your assistance in this regard, and I know that the appeals which will be made to you will be received and that we can rely upon your co-operation.

MR. C. W. KLINE (Pennsylvania): Mr. President, a couple of resolutions have been handed to the committee on resolutions. There comes to this convention a far cry from the great manufacturing city in the little state of Rhode Island, asking for the moral support of this convention.

WHEREAS, An Independent telephone company of Rhode Island has petitioned the city council of the city of Providence for permission to install an Independent telephone system in that city; now, therefore,

Be It Resolved, That we in convention assembled, representing four million Independent telephone subscribers, do hereby request that honorable body to grant the petition to the end that these four million subscribers may not be debarred from direct communication with the industries of that great city, and

Be It Further Resolved, That a copy of this resolution be forwarded to the honorable mayor and the city council of the city of Providence.

The motion to adopt the resolution was then put and carried.

MR. KLINE: The Committee on Resolutions think that the fine treatment we have received at the hands of the committees, at the hands of the manufacturers, of the supply men, at the hands of the management of this hotel, deserves something a little more than passing notice, and we have prepared and will submit to you this resolution and move its adoption:

WHEREAS, The delegates and visitors of the annual convention of the International Independent Telephone Association have been royally entertained by the various committees and by the management of the Auditorium hotel; and

WHEREAS, The membership of this convention fully appreciates the kind efforts in their behalf at this, the banner convention, ever held by this association; therefore,

Be It Resolved, That we extend to the various committees and to the hotel management our hearty thanks for their kindness; and

Be It Further Resolved, That we extend the thanks of this convention to the managers and supply men for their fine exhibits and for the material, financial support which they have so liberally extended to this association; and

Be It Further Resolved, That the convention extend its hearty thanks to the press committee, to the Associated Press, to the Scripps-McRea News service, and to the press of the country in general, for their full and impartial reports of these proceedings.

The motion was seconded and carried.

MR. DWIGHT E. SAPP: I am here for the purpose of presenting to the convention the report of the committee on nominations.

THE CHAIR: We will hear the report of the nominating committee. Will Mr. Sapp come forward, please? I wish to ask if the committee on nominations has conferred with the committee on changes to the constitution and by-laws, so that the nomination will conform to any changes in the constitution in the number of officers.

MR. SAPP: Mr. President, we understand that the committee on constitution has suggested amendments that will conform to the nominations made by the committee and to the

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Familiar Faces of Notable Operators and Manufacturers who Attended the A nnual Convention of the International Independent Telephone Association.

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changed condition of the by-laws. The committee that is about to render an account of its doings to you has had some little difficulty in formulating a list of nominees that would seem to express the existing sentiment not only among the delegates, but among other interests that are concerned in supporting and maintaining the work of this organization. The controlling purpose of the committee has been to undertake to present for your consideration and approval a list of names made up of those in the movement who are active operators and who have a substantial financial interest at stake, and in other respects who have demonstrated their fitness for the position to which they are nominated by your committee, because of the work they have done in the past and the work that may be expected from them in the future. With these considerations influencing them, your committee, Mr. President and Gentlemen, beg leave to submit the following report:

To the President and Delegates of the International Independent Telephone Association:

Your committee appointed to present nominees for the various offices to be filled at this session of the association, respectfully report the following:

For President—Theodore Gary, of Missouri.
For First Vice-President—Frank L. Beam, of Ohio.
For Second Vice-President—Charles E. Sumner, of Oregon.
For Third Vice-President—E. B. Fisher, of Michigan.
For Fourth Vice-President—Alpheus Hoover, of Ontario.
For Secretary—Charles West, of Pennsylvania.
For Treasurer—Manford Savage, of Illinois.

Dwight E. Sapp, *Chairman,*
Richard Valentine,
E. L. Barber,
Charles West,
M. L. Clawson.

Mr. Wood: I move that the rules be suspended and the secretary be instructed to cast the unanimous ballot of this convention for all of the gentlemen nominated for the respective offices.

The motion was seconded.

The Chair: You have heard the motion, gentlemen, which is to suspend the rules and elect the officers named by the nominating committee. Are there any farther remarks? If not, all in favor of the question will signify by rising. (Members rise.)

The Chair: Is Mr. Gary in the room? I will appoint a committee consisting of Mr. Sapp and Mr. Barber to escort the newly elected president to the chair.

Mr. Gary was escorted to the chair by Messrs. Sapp and Barber, and took his seat amid loud applause.

Mr. Hoge: I want to say, gentlemen, it is a very great pleasure to me to welcome as my successor Mr. Gary, who has worked with me so heartily and so pleasantly all the way through for the past three years in this organization, and I think we may be congratulated in having him elected for our next president.

President Gary: Gentlemen, it is hardly necessary for me to say that I appreciate this distinction and the honor of being elected president of the International Independent Telephone Association. I esteem the honor very much—more, I believe, than to be elected to the governorship of any state in the union. In assuming these duties, if you will pardon me, I will state that I expect to carry out, as far as possible, the motto that I use in my own business that is, "Render Good Service," and while I am doing that I always keep in mind that one party to the contract is the public. I shall consider the members of this association as the public in this case. It shall be my endeavor to stand for a square deal, and if it ever occurs that any of the membership of this association fails to get such a deal, I shall be glad to have them call my attention to it, because if they do not receive such treatment and such a policy is not carried out it shall be a mistake of the head and not of the heart.

It shall be my endeavor to serve the entire interests of the association—no particular section, no particular interest, but all. The motto on the back of our program here, "Each for all and all for each," shall be carried out to the best of my ability. My motto along these lines, with those whom I am associated with, has always been to be frank, and I ask the members of this association to be frank with me. If there are any suggestions that occur to you I would be glad to hear of them. If there is any way occurs to you that the association could do more effective work, I would be glad to have that suggestion.

I want to congratulate you on the great success of this convention and the class of representatives. I would not attempt to say as much as the speakers have said heretofore on this line, but I think you are to be congratulated on the improvement from year to year in the personnel of the association, the personnel of the representatives and the delegates and those who take part in these deliberations.

As I have said, I want to carry out the motto of rendering good service. That is what we should all undertake to do in the carrying on the telephone business, and the rest is easy. I thank you, gentlemen.

Mr. Wood and Mr. Deering escorted Mr. West to the secretary's desk, who spoke as follows:

Mr. President and Gentlemen of the Convention: I am a far better worker than I am a talker, but I do want to say that I very highly appreciate the honor that has been conferred upon me today, and I want you to feel that my entire efforts will be with the Independent movement that is now going on in the great United States. I shall be loyal to my duties, loyal to the officers of this association, and shall be glad to do anything at any time for this association.

Mr. Glass: Mr. Chairman, I would like to suggest that a committee be appointed to escort the new treasurer. He is from the "Sucker State." He is not quite as large as our president and secretary, but they say fine articles are put up in small packages. I would like to see our new treasurer, Mr. Savage, take his seat.

Mr. Savage was escorted to his seat by Mr. Glass and addressed the convention as follows:

Gentlemen of the Convention: Like my associates who have thanked you for the honor conferred, I can do the same thing, for, believe me, it is an honor to be elected to an official position in an organization composed of gentlemen like those present, who are engaged in a business that touches more nearly and closely the very life of men, women and children in this country than any other public utility concern—a business that was founded by men upon the then startling doctrine that there is no monopoly of human genius, no natural monopoly of human genius, and no divine right given to Boston millionaires to transmit articulate speech from one human being to another.

We have met in numerous conventions, state, inter-state, national, and now we have reached the high dignity of International. We all have our various views, perhaps, of the profits that come from such an organization. To my mind the greatest benefit that will come to us is not the settlement of practical questions, which will largely have to be fought out by the individual operators, but in the development, if I may so term it, Mr. President, of the fraternal spirit, binding together those engaged in the same occupation to the end that each may feel toward the other that he feels a little bit different toward a man engaged in the telephone business than he does toward one engaged in any other. This association will be productive, in my judgment, of very much greater benefit in the future than it has in the past to all of us. If it ever fails, if it ever goes to pieces, it will be, in my judgment, because it strikes the rock of human selfishness or that those on board abandon the ship when they think they see rocks which are purely imaginary and nothing of the kind, because it is my belief that those elected to the important positions in the future will, like those elected in the past, conduct this association along the lines of malice toward none and charity for all. I am sure this administration will endeavor, so far as I am acquainted with it, to give everybody a square deal, and that is all we can any of us ask.

I think, gentlemen, that I need say nothing more, except, perhaps, to drop the hint that there are many members, efficient men, who never come to the front in our conventions, because they think that those whose names are familiar to us and whose forms are familiar to us occupy the floor sufficiently, and a false sense of modesty on their part prevents the association from getting the benefit of the knowledge which these men, on account of experience and learning, have.

I thank you very heartily again, with the assurance that whatever I can do to advance the cause of the Independent telephone and to advance the cause of this association will be done most heartily and to the best of my endeavors.

The Chair: Is the committee on constitution ready to report?

Mr. Charles E. Sumner: Mr. President. the committee on constitution and by-laws beg leave to report that the constitution be amended in the following respects:

ARTICLE V.—OFFICERS.

The officers of this association shall consist of a President, First, Second, Third, and Fourth Vice-Presidents, a Secretary and a Treasurer, which latter two offices may be filled by one and the same person.

A Member: I move the report be adopted section by section. (This action was taken and the motion prevailed).

ARTICLE VI.—EXECUTIVE COMMITTEE.

The President shall within sixty days after the annual meeting appoint, subject to the approval of the Advisory Board, six members who, with himself, shall constitute an Executive Committee of seven. The President shall also fill all vacancies in said committee within thirty days after they occur.

ARTICLE IX.—ANNUAL AND SPECIAL MEETINGS.

The exact time and place of holding the annual meeting of this association shall be fixed by the Executive Committee at least three months in advance and shall be announced through the telephone journals. Special meetings may be held at such other times and places as the Executive Committee may from time to time direct. The call for any such special meetings (stating the time, place and objects) shall be mailed at least fifteen days prior to the time of holding the same, to the members of this association, and no business affecting the general interests of the association shall be disposed of except as specified in the call.

This amendment vests with the executive committee the power to fix the time and place of meeting, whereas the section as unamended provides that the annual meeting shall be held within thirty days of the first day of June of each year. Will you explain that, Mr. President?

THE CHAIR: I will explain the object of the suggested change. As you know, perhaps, all of you, some time in January in each year there is an exhibition here called the Electrical Show. The exhibitors are in many instances the manufacturers of telephone apparatus, and they say that they have a very large attendance of telephone people, operators and others that are interested. It has been suggested that these two meetings might be held together, and in order to give that suggestion consideration and to make it possible to adopt it, in the event that it should be thought wise, it will be necessary to change article IX to allow the executive committee the right to select the time as well as the place. What will you do with the proposed amendment?

MR. FISHER: I move its adoption.

The motion was seconded and carried.

ARTICLE X.—MEMBERSHIP.

Section 2.—The Executive Committee is authorized and empowered to create sectional memberships for manufacturers, supply dealers, engineers, publishers of telephone magazines and journals, and honorary members, and to fix the dues thereof, also to fix the representation to which such sections shall be entitled, provided, however, that the total representation of all of such sections combined shall not exceed one-third of the representation of the total delegates entitled to attend any convention.

ARTICLE XII.—REPRESENTATIVES.

The several state, territorial or provincial associations, members of this association, may be represented at the annual or any special meetings of this association by delegates chosen or appointed by said organizations in such manner as may be prescribed by the constitution and by-laws of such associations; but the number of delegates so chosen shall not exceed one for each 10,000 units or a majority fraction thereof as prescribed in Article X of this constitution. The units herein referred to are only represented by the membership of such state, territorial or provincial associations.

ARTICLE XVII.—DUTIES OF THE TREASURER.

The duties of the Treasurer shall be to receive all moneys of the association and to safely keep and pay out the same upon the approval of the President and Secretary. He shall also be custodian of any contracts or other papers except the records of the proceedings of the association. He shall give bond of some approved surety company for such an amount as may be required by the Executive Committee, said bond to be approved by the Executive Committee and paid for by the association.

ARTICLE XVIII.—DUTIES OF ADVISORY BOARD.

The Advisory Board shall meet at the place of holding the annual convention the day preceding the first session of the convention at 2:00 o'clock p. m. It shall appoint the following committees which shall report to the convention:

1. Committee on Credentials.
2. Committee on Nominations.
3. Committee on Amendments to the Constitution.

It shall hear reports of officers and Executive Committee, and recommend a policy to be pursued by the association at its convention. It may be called together at any time by the Executive Committee, upon ten days' notice, which notice shall also specify the object and necessity for calling the meeting. A majority of the members attending a meeting shall constitute a quorum for the transaction of business.

ARTICLE XIX.—DUTIES OF THE EXECUTIVE COMMITTEE.

The duties of the Executive Committee shall be to co-operate with the officers in promoting the interests of the association. They shall have the right to create the office of assistant to the Secretary or Treasurer and employ one or more to fill these offices, who shall give their entire time to the interests of the association. They shall appoint a Public Accountant, who shall audit the accounts of the association semi-annually in the months of May and November, who shall report the November audit to the President of the association, and the May audit, which shall include the entire year's business, to the Advisory Board at the time of the annual convention. They shall fix salaries of all officers and employes, said salaries to cover actual time spent in the interests of the association. They shall allow actual traveling expenses when exclusively on business of the association. They shall assist the officers in doing all things necessary to make the organization a success, and such other duties as are prescribed herein.

THE CHAIR: I believe that ends the work of the committee on constitution and by-laws, but there is one other point in the amendments to the constitution and by-laws I think it would be a good plan to take up. Our name is very long, International Independent Telephone Association of America. It seems to me it would be just as effective if we would drop the words "of America" and have it the International Independent Telephone Association. I will entertain a motion to this end.

MR. FISHER: I will support that motion.

The motion was put and carried.

THE CHAIR: If there is nothing more to come before the convention, a motion to adjourn will be in order.

But before hearing from you on that point, I want to urge on every one of you that when you return home you talk about these meetings, keep up the enthusiasm, talk about the necessity of organization, the value of organization, and keep up the work continuously, because we cannot expect to have good meetings and obtain results unless we all work every day in the year. We must adopt the same business methods in connection with the association work that we do with our own business; and if it is worth doing at all, if it is worth our spending our time and money to come here once a year and spend a week's time, practically, it is certainly worth our while to give it some attention between times, and without this attention we cannot expect to succeed. If there is nothing further, gentlemen, a motion to adjourn will be in order.

MR. WOOD: Mr. Chairman, I move that this, the most successful Independent telephone convention that has ever been held, do now adjourn.

The motion was seconded and carried.

The annual banquet was held in the banquet hall of the Auditorium hotel Wednesday evening, June 5th, and was largely attended by the telephone operators and manufacturers. Hon. H. C. Kline, Hazelton, Pa., performed the ceremony of toastmaster. The after dinner addresses were: "The New South," Luke Lee, Nashville, Tenn.; "The Empire State," T. Harvey Ferris, Utica, N. Y.; "The Telephone in Modern Life," Helm Bruce, Louisville, Ky.; "After a While" (assigned to H. D. Critchfield), responded to by General Goddard, Kansas. During the menu an orchestra furnished the music and interspersed with the speeches the Weber quartette, with popular songs.

Manufacturers, supply dealers and the makers of auxiliary devices and allied apparatus, including dealers in poles, were generously represented. All of the sixth floor rooms were taken and the overflow on the parlor floor extended in every direction. We attempt to name the concerns and representatives in the following list:

Adams-Randall Telephone Company, 136 Liberty St., New York, G. C. R. Marshall.

American Conduit Company, Marquette bldg., Chicago, W. B. Waterbury.

American Electric Fuse Company, Muskegon, Mich., F. G. Jones, Jas. A. Kenny, Geo. W. Rodormer.

American Telephone Journal, New York, W. H. McDonough, C. H. Fritchman.

American Electrical Novelty Company, 316 Hudson st., New York City, N. Y., A. E. Barlow, R. E. Bain, P. E. Reiners.

American Electric Telephone Company, Chicago, P. C. Burns, J. G. Ihmsen, Max W. Zabel, D. R. Hoffman, W. J. Staunton, Ira Butterfield, H. T. Blackledge, J. A. Stratton.

American Sewer Pipe Company, Pittsburg, Pa., W. R. Adams.

American Steel & Wire Company, Chicago, C. S. Knight, Jr., B. B. Ayres, Frank Conklin, A. T. Merriman.

Automatic Electric Company, Chicago, C. L. Fisher, F. L. Middleton, H. H. Woodworth, P. J. Eubanks, J. A. Russell, J. E. Fisher.

F. Bissell Company, Toledo, O. F. Bissell, Walter Bissel, C. M. Hamilton, J. A. Navarre, Murray Townsend.

Belden Manufacturing Company, Chicago, Jos. Belden.

W. J. Burns, Chicago.

H. B. Camp & Co., 85 Hartford Bldg., Chicago.

Chance Manufacturing Company, Centralia, Mo., A. B. Chance.

Carnahan-Sherwood Company, Indianapolis, Ind., R. H. Carnahan, C. M. Glover, H. E. North.

Century Telephone Construction Company, Buffalo, N. Y., C. H. Macklin, W. W. Kidney, F. O. Rhode, G. F. C. Bauer.

Chicago Electric Manufacturing Company, Chicago, H. F. Aspbury.

Chicago Telephone Supply Company, Elkhart, Ind., G. A. Briggs, Geo. W. Brown, F. P. McIntosh, D. R. Roseborough.

Clay Products Company, Brazil, Ind., F. W. Darling.

Churchill Cabinet Company, Chicago, Ole Gullickson, Jno. J. Keenan.

Chicago Electrical Exposition Company, Chicago, Homer E. Niesz.

Geo. W. Conover, 135 Adams st., Chicago.

Commercial Electric Supply Company, 1009 Market st., St. Louis, Mo., H. L. Parker.

A. J. Cox & Co., Chicago, A. J. Cox.

Frank B. Cook, Chicago, J. F. Tompkins, H. R. Cook, S. C. Harvey, F. R. Parker, E. E. Dewey.

Central Telephone & Electric Company, St. Louis, Mo., J. C. Cummings, C. H. Walis, L. G. LeBourveau.

H. E. Cobb, Chicago.

Crescent Lumber Company, Pittsburg, Pa., W. A. Kesler.

W. H. Crumb & Co., Chicago, W. H. Crumb.

Dean Electric Company, Elyria, O., W. W. Dean, A. E. Barker, G. A. Scoville, E. M. Ford, A. B. Smith, W. H. Scott, A. G. Beau, L. G. Bowman.

Dinsmore & Lawton, Chicago, S. A. Dinsmore.

Duplex Metals Company, New York City, Byron S. Eldred.

Durant Electrical Supplies Company, Chicago, H. S. Durant, J. F. Crook, F. W. Pardee.

Edwards-Hine Company, Grand Rapids, Mich., Chas. C. Wilmot.

Electricity Magazine Corporation, Chicago, Ed J. Mock, Frank M. Bailey.

Electric Appliance Company, Chicago, E. R. Field, J. B. McMullin, J. K. Alline, M. I. Blakemore, H. N. Remington, M. L. Scobey, R. S. Mitten, P. R. Boole.

Eureka Electric Company, Genoa, Ill., H. W. Foote, G. H. Miller, J. H. Bell, E. L. Larrabee, H. Mahren.

L. M. Ericsson Telephone Manufacturing Company, Buffalo, N. Y., J. H. Montague, J. R. Powers, H. B. Hewitt.

Everstick Anchor Company, St. Louis, Mo., Jasper Blackburn.

Fahnestock Electrical Manufacturing Company, Brooklyn, N. Y., E. B. Fahnestock.

Fibre Conduit Company, Orangeburg, N. J., W. W. Smythe.

General Engineering Company, Chicago, E. W. Hammer.

Homer Roberts Telephone Company, Chicago, A. F. Rosenberger, Homer Roberts, C. A. Soans, C. A. Bottorff, H. D. Nuttal.

Holtzer-Cabot Electric Company, E. R. Harding, F. G. Meinema, W. F. Taylor.

Hubbard & Co., Pittsburg, Pa., Carl Seyler, Chas. B. Holdredge.

Illinois Electric Company, Chicago, N. G. Harvey, C. J. Lichter, E. A. Quarfoot, F. D. Rustling, M. F. Cronin, Dewey Newman, C. McIntyre.

Illinois Specialty Company, Chicago, G. M. Kazanjian.

International Telephone Manufacturing Company, Chicago, Henry Shafer, W. E. McCormick, J. C. Burmeister, Fred Freers.

Indiana Steel & Wire Company, Muncie, E. F. Kitselman, Robt. Miller.

Jones & Winter, Chicago, S. A. Jones.

Milo G. Kellogg, Chicago.

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Linsley Bros. Co., Spokane and Chicago, G. L. Lindsley.
Lindsley Bros. Co., Spokane and Chicago, G. L. Lindsley.
Long Distance Telephone Manufacturing Company, South Bend, Ind., C. K. Seibert, R. E. Willard, F. L. Heyers, V. V. Mann, L. F. Osborn.
W. N. Matthews & Brother, St. Louis, Claude L. Matthews, O. R. Johann.
McRoy Clay Works, Brazil, Ind., E. F. Kirkpatrick.
McMeen & Miller, Chicago, Kempster B. Miller.
Miller Anchor Company, Norwalk, Ohio, G. H. Miller.
Mountain State Electrical Company, Wheeling, W. Va., Frank B. Hall, A. F. Poole, J. C. Frasher.
Monarch Telephone Mfg. Company, Chicago, J. E. Norling, J. C. Hubacher, E. E. Yaxley, W. H. Trimm, R. C. Stone, A. J. Carter, T. L. Dunlap, W. A. Fricke.
Nagel Electric Company, Toledo, W. G. Nagel, H. E. Adams.
National Carbon Company, M. H. Moffatt, A. V. Ward, Wallace O'Conner, E. J. Kenny.
National India Rubber Company, Bristol, R. I., P. F. Lyons.
National Pole Company, Escanaba, Mich., H. W. Reade, A. D. McIntyre.
North Electric Company, C. H. North, J. F. Engle, A. A. Marrs, A. A. Miller, R. Hendrickson, G. B. Pratt, C. D. Boyd.
Nungesser Electric Battery Company, Thos. G. Grier, Hibbard S. Green, H. G. Robbins.
Paducah Pole & Timber Company, Paducah, Ky., A. B. Smith.
Pierce Specialty Company, Elkhart, Ind., A. L. Haase, R. L. Crane.
Protective Electrical Supply Company, Ft. Wayne, Ind., M. B. Larimar, F. X. Staub, E. M. Popp, M. Umbaugh.
Rock Island Battery Company, M. A. Loeb, Chas. Wilson.
Sandwich Pole Changer Company, Sandwich, E. C. Hennis, H. O. Rugh.
Select Telephone Manufacturing Company, W. M. Bruce, Jr., C. D. Juvenal.
Skelly Telephone Manufacturing Company, Cleveland, T. J. Skelly.
Standard Underground Cable Company, J. R. Wiley, A. A. Anderson, J. E. O'Neill, W. M. Rodgers.
Steel Gain Company, Chicago, Frank McDonough, W. H. Trimm, J. E. Norling.
Sterling Electric Company, Lafayette, Ind., W. E. Doolittle, W. R. Coffroth, H. T. Doolittle, Evan Shelby, Geo. Skinner, O. P. Reed, C. R. Brown, S. B. Fowler.
Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., A. M. Haubrick, Wm. Bowen, J. J. Nate, D. C. Gould, Paul D. Myers, Ben C. Hyde, E. P. Shafer, A. B. Crawford, S. W. Menefee, H. A. Jones, Chas. F. Speed, J. B. Wilkinson, O. M. Leich, W. Roy McCann, C. W. Shafer, H. C. Slemin, A. O. Stigberg, F. G. Hudson, E. W. Lewis, A. L. Johnston, T. E. Wright.
Swedish-American Telephone Manufacturing Company, Chicago, E. B. Overshiner, A. V. Overshiner, T. Lidberg, F. M. Ferguson, M. L. Golladay, Stanley Duvall, C. L. Ward, Jas. Fox.
Telephony Publishing Company, H. B. McMeal, H. D. Fargo, W. H. Graffis, W. C. White.
United Brass Manufacturing Company, Cleveland, O., W. J. Schoenberger, Thos. B. Daley.
United States Coin Register Company, Toledo, O., W. G. Nagel, G. S. Powell.
United Clock Company, Chicago, Albert Tuerk, A. T. Bagley, E. E. Yaxley, R. W. Trimm, J. E. Norling.
Universal Pole & Post Preserving Company, Circleville, O., H. P. Folsom.
Vote-Berger Company, La Crosse, Wis., M. I. Berger, C. D. Enochs, J. F. Pfeiffer, J. W. Johnston.
Vulcan Electric & Heating Company, Chicago, L. P. Brown, R. A. Wolf.
Warner Electric Company, T. W. Warner.
B. F. Wasson, Clinton, Ill.
Western Telephone Manufacturing Company, Chicago, C. L. Johnson, E. A. Anderson, Eugene L. Brown, C. G. Peacock.
Wire & Telephone Company of America, Rome, N. Y., Frank Powell, Harry Hammond, A. J. Kennedy, J. Allen Haines.
C. H. Worcester Company, Chicago, Mr. Williams.

Troubles on Common Battery Exchanges

By Arthur Bessey Smith

A VERY interesting type of substation instrument for common battery work is that which employs a retardation coil in series with the transmitter. The wiring of the telephone is shown in Figure 1. *L* is the retardation coil, which has rather low ohmic resistance, but relatively high self-induction. The impedance for one such coil has been known to be as high as 3,000 ohms to the fundamental frequency of a man's voice, although the ohmic resistance was only 25 ohms. It will be noted that when the receiver is hanging on the hook the bell and condenser are alone on the line, with the same series arrangement as was shown in our last paper. This is one of the fundamental combinations, and will be found in nearly all common battery telephones. In the instrument described before, the bell and condenser were permanently connected together and to the line. Also, the

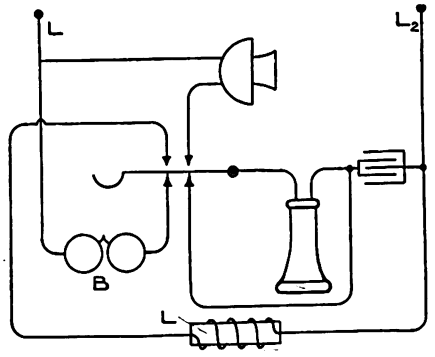

Figure 1.

condenser played no part in the transmission of speech. In this telephone the bell and condenser are not permanently connected, and the latter is made to help in both transmitting and receiving speech. In studying any diagram it is often found advantageous to rearrange the parts in such a manner as to make them show more clearly what is going on and how the changes are made. The term "simplified diagram" has aptly been applied to this device, and every telephone man should know how to reduce a circuit to the point where its action is clearly revealed. It will require a little study at first to dig out the essentials of a circuit, but the effort will be more than repaid in a better insight into the circuit in hand and a better ability for attacking the next case. It may often require two or three sketches to bring the circuit to the desired point. The first time you draw it off it will be a little more simple than you found it. The next sketch will enable you to untangle another knot, and perhaps to make further simplification unnecessary.

The case in hand is a very simple one, and might easily be discussed without further change. But to make the matter entirely clear, Figure 2 has been prepared. In this the essentials are very easily seen. Beginning at L^2 we have the condenser, receiver, and main spring of the hook in series. Tracing from L^1 we find the transmitter forming the path to one of the upper contacts of the hook, while the bell leads to one of the lower contacts. Thus the condenser and receiver may be switched either to the transmitter or to the bell, very much like a two-throw switch on a railroad track.

In the ringing position, this would make a circuit from L^1 through the bell, receiver, and condenser to L^2. From a ringing standpoint, this would not be such a very bad circuit, but unfortunately it would make sad work of the receiver in a short time. So a wire is run from a point between the receiver and condenser to a contact on the under side of the main spring of the hook. This effectually short-circuits the receiver, keeping all ringing current out of it.

When the receiver is taken from the hook, the condenser and receiver are placed in series with the transmitter. If voice current were to be brought by a wire to L^1, it could easily pass through the transmitter, since it is merely a non-inductive resistance. The condenser is also easily passed, so that a person could hear very well. But since the condenser is open to battery current, you could not talk. To get around this difficulty, a retardation coil is placed at *L*. A non-inductive resistance would do as well as the inductive coil for the purpose of talking, for it would let the battery current from central pass through the transmitter—the thing desired. But if a non-inductive resistance were placed there, it would practically short-circuit the receiver. The retardation

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coil does just what we want in this case; it lets the battery current pass to feed the transmitter, and tends to choke out the high frequency voice current and force it to go through the receiver. The condenser also does a selective business, keeping the battery current out of the receiver, but allowing the alternating current to go through. This is one of the best examples of the uses to which condensers and retardation coils may be put. In

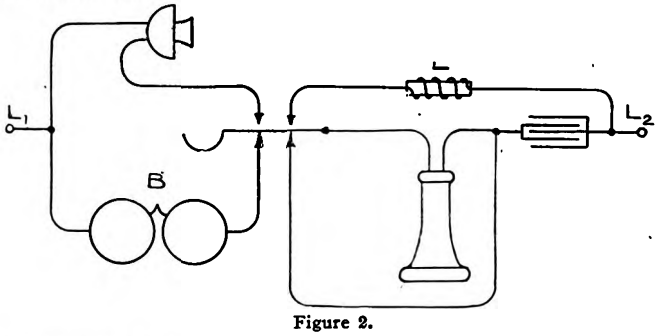

Figure 2.

the general design of circuits, if you have any place in your circuit where you wish to allow high frequency alternating current to pass, but the conditions of operation will not admit of allowing battery current to flow, then put in a condenser. If the reverse is the case, where you wish to feed battery to any part without losing any of your talking current in the operation, put in a good retardation coil.

So far, little has been said about the hook. Very much depends in every telephone on the kind of hook that is used and the manner in which it works. The time of the old fashioned hook, consisting of several parts fastened to as many places in the bell box, is passed. There are still a few companies who try to get along with it, by allowing a generous margin to take care of the warping of the wood to which it is attached. It does no good for a manufacturer to say that the wood is all thoroughly seasoned and will not change its shape. The best seasoned wood in the world is not proof against the changes of climate and weather. The self-contained hook has come to stay, and the best telephones are now supplied with them.

The character of the contact points is also of great importance to the trouble man. At first it was thought that brass or German silver would make excellent contacts. They do, if the pressure is great enough to force them into good contact. This is the case in the switchboard jack as the plug is pushed in with relatively great force. But in the hook such pressure is impossible.

It was then thought that a rubbing contact would do the business, so hooks were designed to operate in such a manner that in the upward motion of the lever the springs were made to slide on each other and on the lever. This was better, but still not good enough. And it was not merely a case of over-fastidiousness on the part of telephone men, for many real cases of trouble were located at the hook contact, so that many of the older trouble men carried fine sand paper or emery cloth to clean them.

These things have driven the manufacturer to use a metal which will give absolutely certain results with rather light pressures. Up to the present time platinum is the only metal which fills the bill. It is to be hoped that the available supply of platinum will greatly increase or that a good substitute will be found.

In the older hooks the springs made contact directly with the lever, which gives rise to the conventional symbol for the hook switch which is yet in use. The modern hook is made up of a number of flat springs, one of which has mechanical connection with the lever, so that the motion of the latter can be communicated to it and make and break the proper connections. This is a great advance in that it allows the hook to do many things which it could not otherwise do. One of the best is the possibility of insulating the lever from the electrical circuits of the telephone, relieving the subscriber from shocks due to battery or ringing current. These shocks are often more annoying than dangerous, but if the hook can just as well be insulated as not it is better to do it. Another point of advantage is the number of springs that are easily added and the possibility of making them act in a given order. Referring again to Figure 2, it would at first sight appear immaterial in what order the contacts of the hook are made or broken. Suppose the hook to be rising, let the bell contact break first, followed by the short-circuit contact. The receiver is now in position to be thrown into circuit. If the retardation coil spring hits just before the transmitter contact, the sudden rush of current will make a bad click in the receiver. The current which affects the receiver is the charging current going into the condenser. As the flow in the transmitter circuit is rising there is an electromotive force produced across the terminals of the retardation coil. This is in part due to the ohmic resistance of the coil, but more largely to the self-induction which it possesses. When the current has reached a steady condition, and the condenser is as full as it will get on that voltage, the receiver will be quiet.

Now suppose that the order of closure of the two upper springs is reversed. When the transmitter spring touches the main spring, there will be a rush of current into the condenser which will make a click in the receiver. This would charge the condenser to the full voltage of the central office battery if the hook were to move slowly enough. Then when the retardation coil contact touches, current will flow through it, reducing the voltage across the terminals of the condenser. This will allow part of the charge to flow out through the receiver, producing another click, or perhaps intensifying the first click. In practice, the hook may perhaps never move slowly enough for the condenser to rise anywhere near the full voltage of the battery, but it is certain that with either connection there is much noise produced.

If we now bend the springs so that the short-circuiting spring will remain in contact till both the upper springs have come into contact, the condenser will be

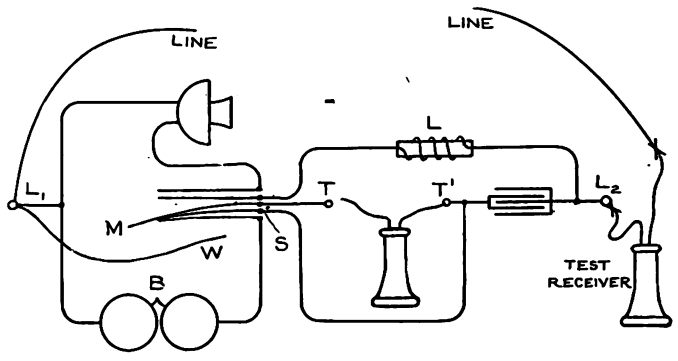

Figure 3.

charged, all the period of "rush" will be over, and the receiver will be noiseless. This quality of this instrument may seem to be of minor importance, but its study has led us to a better understanding of the apparatus and its possibilities. And when a subscriber is working the hook to call the operator back onto the connection, it is a distinct pleasure not to be obliged to hold the receiver away from the ear while so doing.

The troubles that may occur in the ringing circuit of this telephone are not numerous. Compared with the

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ringing circuit of a magneto set, it is simplicity itself. I will not make any special discussion of troubles due to bad adjustment of the ringer movement or the gongs, as any good magneto man knows how to take care of that already. It should be said in passing, however, that the proper adjustment of bells is just as important in a common battery telephone as in a magneto. It should be carefully and thoroughly done. If the line is not properly protected from lightning, now and then a condenser may go bad; that is, become short-circuited. If the lightning arrester has too wide an adjustment, it will require too great a voltage to break down the resistance of the air gap. This means that before the discharge occurs, the voltage across the terminals of the condenser may rise high enough to break down the insulation between the layers of tinfoil. As this is usually only two thickness of very thin paper, saturated with paraffine, it does not require a very high voltage to do this. When a condenser breaks down, it does so by the carbonizing of the paper and paraffine. This is left in the form of a permanent conducting path, allowing the battery current from central to flow. The line lamp on the switchboard will light and remain lighted, being termed a "permanent," or a "shiner," in common parlance.

At the instrument it will show itself by holding the clapper of the bell over to one side. If the tendency of the clapper to stick to one side is due to a leaky condenser, it may be shown by reversing the line wires, wnen the clapper should hug the other gong. Sometimes a bell is found in which the magnetic circuits are so unbalanced as to give the clapper a natural tendency to go one way. But even with a bell like this, the difference in action will be marked enough to notice. Or a still better test is to examine carefully to see if there is not a chance of current getting around the condenser in some other way, even if the condenser be in perfect condition. There may be a cross at the hook between the retardation coil wire or spring and the main spring or its connecting wire. It will be seen that this allows a steady flow around the condenser when the hook is down, producing the same effect as if it were leaky. A good, careful inspection of all the wires concerned will usually show whether there is a cross of this kind or not.

I am a believer in the value of close inspection. Many troubles can be caught in no other way. The intermittent trouble is the best case in point. If a trouble comes and goes, it usually "comes" when the subscriber wants to use his telephone, and "goes" just before the trouble man gets to the premises. These are very annoying and if not found may cause hard feelings on both sides. The remedy is to look over every inch of the ground and make sure that you *know* that everything is O. K. before you leave it. If it is a case of swinging cross between two line wires, don't run by a suspicious place. Just as likely as not you will later be obliged to say, "I didn't think it could get together *there!*" That is always a poor excuse. Every man has to learn the practical conditions which it takes to constitute a danger point, but try not to make the same mistake twice. Try, rather, to reason ahead.

It is a good thing in any case to have a good store of electrical tests upon which to rely when inspection fails. In the foregoing instance, if we desire to know for certain that the condenser is "short," how can we test it alone, without getting current through some other part of the instrument? We could unsolder the wires at its terminals, but we do not want to do that unless we are obliged to do so. Figure 3 shows the actual arrangement of the springs of the hook, *M* being the main spring, or the one which is engaged by the lever. For convenience, the main spring is shown as being down, under which conditions we assume leakage through the telephone. Let our test receiver be connected in series with the whole instrument, so that if there is a leak we can tell it.

There might be a cross between the transmitter and retardation coil wires, which it would not be fair to charge up against the condenser. To remove this possibility, just disconnect one of the terminals of the transmitter. Then there might be a cross between the retardation coil wire and the main spring, allowing current to leak around through the coil. If so, that puts the coil and the condenser in parallel, and we must disconnect one of them in order to tell which it is. Disconnect one of the receiver cord tips from its binding post as at *T*. This removes the receiver from connecting the condenser. But the short-circuiting wire still connects the condenser to the hook and thence to the bell. Lift the hook enough to slip a piece of paper both above and below the spring *S* and let the hook down again. This removes the last connection of the condenser, but also removes the bell. A wire *W* may now be run from L^1 and touched on the main spring. If this causes a click in the test receiver, then there must be a leak by way of the retardation coil. If you get no click, that part of the circuit is clear, and it must be in the condenser. Test it by putting *W* on *T*.

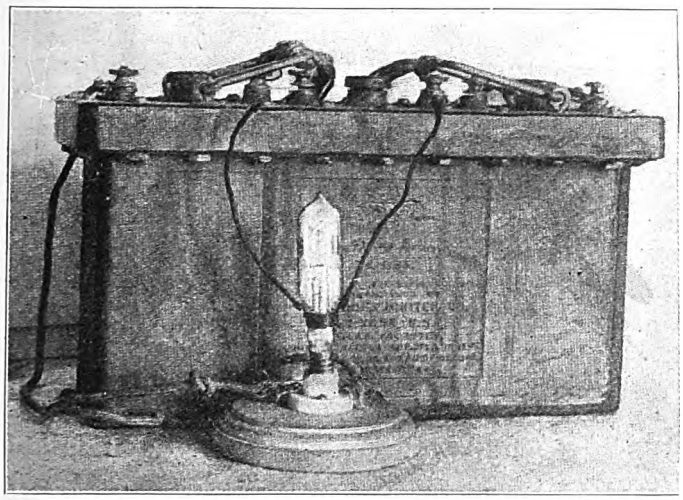
In making any test, one should keep in mind the actual construction of the apparatus. In this case, the springs of the hook are usually connected together by brass bolts which run through holes in the springs. These bolts are carefully insulated by hard rubber, and it is not often that any trouble occurs here, but it is a possibility for a cross to form between some spring or springs and the bolt. If it should so happen that the retardation coil spring and the bell spring were to become grounded on the bolts, it would make the leak to which we are referring. The tests so far would not show it, and it would be necessary to unsolder the retardation coil wire from the hook to get a sure test. This fault might not occur more than once in a lifetime, but the trouble man has to be on his guard against the unusual and unexpected thing. It does not require very much of an expert to fix ordinary, every-day troubles; it is the hard case that tries a man's skill and raises his pay check.

A packed transmitter will not affect hearing, as it will only prevent you from making yourself heard. If there is a loose connection in the transmitter or its part of the circuit, or a complete open, it will affect both talking and hearing. This is readily seen, for the transmitter is directly in the path of both the battery and the alternating currents. If the retardation coil is open at any point of its circuit, it will prevent you from talking, but the hearing will be the same as ever. If for any cause the coil should get short-circuited it would shut the receiver out by short-circuiting it. You could talk the same as ever. If the receiver goes short, it will affect hearing alone. If the receiver circuit breaks at any point, it would seem that hearing would be entirely cut off and talking very greatly impaired. It certainly does cut out all hearing, but about talking, the theory is not realized. If we have a very heavy inductive coil, it will allow battery current to go through it as well as a non-inductive coil, although it will take longer for the current to arrive at its full strength. But if the inductance of the coil is high enough, it will choke out nearly all high frequency voice waves. This is what one would expect in the coil in the telephone we are discussing. But in practice we find that with the receiver disconnected we can talk to the other subscriber about as well as if the receiver were connected. The transmission is undoubtedly less loud, but the average ear will not detect it. This is because the inductance of the coil is not high enough to reduce the

Wireless Telephone System

By Herbert T. Wade

THE question of wireless telephony is by no means new and such experimenters as Preece, Ruhmer, and Arco in Europe, as well as several scientists in this country, have been at work on this problem for several years. The differences between wireless telegraphy and wireless telephony are in the main as fundamental as in the two familiar systems employing wires. While the telegraph transmits an electric current so interrupted as to correspond to signals arranged by a given code, the telephone depends upon the rapidity of interruption or variation in the intensity produced by the sound vibration.

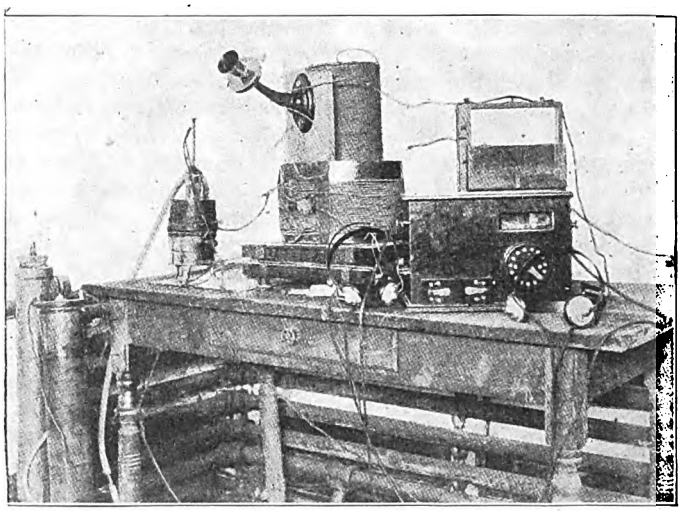


The Audion—A Receiving Instrument for Wireless Telegraphy and Telephony.
(A storage battery is behind the lamp.)

There have been several methods proposed for telephony without wires, the earliest, perhaps, being the radiophone of Prof. Alexander Graham Bell, where a selenium cell was placed in the focus of a silvered parabolic reflector and was connected with a battery and a telephone receiver. The variation in the electric resistance of selenium with the amount of light should be a valuable principle in wireless telephony, but it was found that the radiophone of Professor Bell could be used only over short distances. The effect of telephone currents upon an arc lamp was later investigated, and it was discovered that this device could be used for the transmission of sound. Accordingly, Ernest Ruhmer, of Berlin, combined the "speaking arc" with the selenium cell, and by use of a searchlight for his transmitting apparatus and a selenium cell in a parabolic reflector for a receiver, was able to transmit sound effectively up to seven miles, but his experiments do not seem to have come to any very practical outcome. The reason for this will be apparent when it is realized that the difficulty of directing the beam of light to the distant reflector and the ease with which it could be obstructed or intercepted, not only by solid materials, but by fog, must be taken into consideration. Wireless telephony has also been attempted through ground circuits, and by induction over short distances, but for a really practical system we have to consider such modifications as have come from the development of wireless telegraphy. Count Arco, in Germany, has carried on important telephonic communication with modifications of his wireless telegraph system, while in a demonstration recently made with the Fessenden system wireless telephony was carried on from a tall mast at Brant Rock, across Duxbury Bay to Plymouth, a distance of about twelve miles.

The most systematic and important experiments, however, are those recently carried on by Dr. Lee De Forest, who, for a number of years, has been working in wireless telegraphy, and has devised methods and apparatus that have proved most successful. After almost a year of constant experiment on radio-telephony Dr. De Forest has reached the conclusion that wireless telephony on a practical and commercial scale has been realized.

The practical development of this invention now has progressed so far that sounds produced in Dr. De Forest's laboratory in New York City have been heard not only at other laboratories, several miles distant, but distinctly at Quarantine, twelve miles, on board the steamer Bermudian. In fact, Dr. De Forest has been informed by numerous amateurs in New York City and Brooklyn that their apparatus has frequently responded to the waves corresponding to music sent out from his transmitter. It might be said here by way of explanation that modern wireless telegraph systems employ almost exclusively for long distance work a telephone to receive the signals. This instrument is one of the most sensitive means of detecting the presence of an electric current or any variation in its intensity or frequency. Consequently, if an experimenter is listening for the click, click, corresponding to the wireless signals sent out at some transmitter station, and hears instead music or the human voice, he must know that his apparatus is responding not to the dots and dashes of the Morse alphabet, but to waves in unison with the original sound waves appropriate to the sound. Now, in wireless telegraphy we do not change the frequency of electric waves, but



Laboratory Installation of DeForest Apparatus for Radio-Telephony.

(The enclosed arc is on the left of the table; the telephone transmitter is mounted on the coils, which, in turn, stand on the condenser, while the receiver apparatus is on the right.)

we produce and interrupt them at such frequency as we desire in order to form our dots and dashes. In wireless telephony we have a similar condition, and while we can not vary the frequency of the waves, yet we can vary their amplitude or intensity as we please. Our ability to do this very rapidly, in fact, as rapidly as the vibrations of the human voice or other sound, makes wireless telephony possible, as receivers have been devised suffi-

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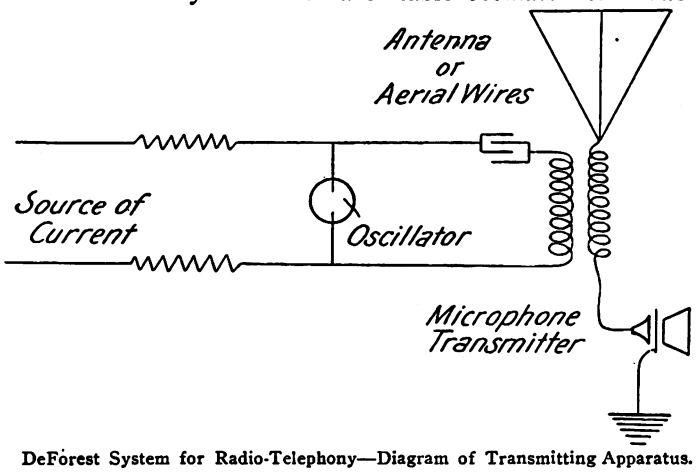
ciently sensitive to respond to these waves and to translate them into varying electric currents which produce corresponding vibrations in the diaphragm of a telephone receiver and thus produce sound that is audible to the human ear.

Passing from general considerations, it may aid the reader to recapitulate the fundamental principles involved in wireless or wave telegraphy. Reduced to its simplest elements, there is an alternating current of high voltage surging or oscillating in a vertical wire, one end of which is earthed while the other is elevated. The current is transformed by means of a suitable oscillator or induc-

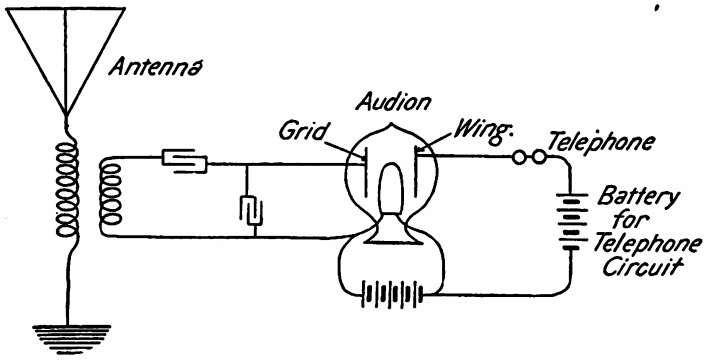


DeForest System for Radio-Telephony—Diagram of Transmitting Apparatus.

tion coil and transformer, so that the current flowing in the vertical or aerial wire or antenna is of high voltage. From this wire electric waves are sent out in all directions with a velocity equaling that of light, some 186,400 miles per second. Corresponding to the antenna at the transmitting station there is a similar one placed at the receiving station in the path of the waves, so that in the circuit of the receiving apparatus corresponding oscillating impulses may be established. These oscillations can take place directly in the antenna, or an induction coil or transformer may be employed. To detect these oscillations we can use any one of several devices that will respond to small differences of electric potential. Thus we have the coherer, where a number of fine metallic fragments group themselves differently for the passage of the waves and enable a current to pass. Then there is the electro-magnetic receiver, such as is used in the Marconi system, where the antenna is connected with the primary coil of an induction coil, and a telephone is in the circuit of the secondary, there being an iron wire which moves through the coils. The electrolytic receiver is also employed, as it is more sensitive than either of those just mentioned. When the current passes through the electrolytic cell of this instrument there is a change in its resistance to which the telephone immediately responds. Finally, there is a receiver, known as the audion, invented by Dr. De Forest, and which is available for both telegraphy and telephony. It consists of a small incandescent lamp having a tantalum of other filament supplied with two small plates of platinum within the bulb, and connected with the outside by platinum leading wires. This lamp is lighted by current from the small storage battery shown in the illustration. The antenna is connected with the two platinum wings, or in the most recent forms of the device, with a grid and a wing Now the interior of the bulb is highly exhausted, and when a current passes there is ionization, or the separation of the rarefied gas into minute particles or ions. When the waves fall on this receiver the resistance of the interior is changed and the telephone which is in the circuit will respond immediately. The audion has been found well adapted for telephonic work and has been used by Dr. De Forest in his experiments on sound transmission.

The experimental apparatus for wireless telephony, as arranged in Dr. De Forest's laboratory, is shown in the illustration. In its commercial form the transmitting apparatus is reduced in size and is of much the same character as the receiver shown in the second photograph. The primary current used can be obtained from the lighting mains or a storage battery, and after passing through inductance coils to prevent any undue variations in the circuit, goes to an oscillator, shown at the extreme left of the picture. This may be any form of high frequency interrupter, though in the apparatus, as now arranged, there is an arc which supplies an alternating current of sufficient frequency. In connection with this is a condenser and the primary of a transformer. The former is under the two large coils of the transformer, shown in the center of the picture. The secondary is connected with the antenna or aerial wire, which in Dr. De Forest's laboratory is mounted on the roof of the building. The secondary is also connected with an ordinary carbon microphone transmitter and then to the earth. Just as in the ordinary telephone transmitter the resistance of the carbon changes with the vibration of the diaphragm, so here the change in resistance affects not the frequency of the waves but their amplitude or intensity. This is in essence the transmitting apparatus, disregarding, of course, such questions as the power that must be used, the nature of the waves (*i. e.,* their length and frequency), and the height of the antenna, all of which affect the distance of transmission. At the receiving station we have the antenna and transformer coil connected to the earth as before, and the audion and telephone arranged in circuit, as shown in the diagram. An ordinary telephone is used, and the audion and telephone battery are contained in a single wooden case, which, with the storage cells used to light the lamps, is shown on the table by which Dr. De Forest is standing.

Wireless telephony will do away with the trained operators on vessels, so that a larger number as well as smaller steamships can be in communication with the shore or with each other during a voyage. Not only can reports be made by coastwise vessels and steamers on the Great Lakes, but the exact position or the dangerous



DeForest System for Radio-Telephony—Diagram of Receiving Apparatus.

proximity of other vessels or lighthouses can be determined. This immediately suggests the use of wireless telephony in naval operations, especially with a fleet, or where a torpedo boat or other vessel is employed on a detached service. Wireless telephony between sea and land does not stop at the receiving station on the shore, since it is possible to connect the instruments so that conversations can be immediately and directly transmitted to the wire circuit of the land system. Furthermore, experiments have already been undertaken which

have demonstrated the feasibility of communicating between moving trains and central offices or signal stations, and even establishing direct connection with public lines. In fact, the readiness with which farmers' telephone lines —often using fence wires—have been constructed in the West leads to the belief that a suitable wireless telephone system would find widespread appreciation in rural communities and mountainous districts.

The great and universal appreciation of music reproduced by graphophone, telharmonium, or other device has suggested to Dr. De Forest that radio-telephony has also a field in the distribution of music from a central station, such as an opera house. By installing a wireless

Dr. Lee DeForest Listening at the Receiving Instrument.

telephone transmission station on the roof, the music of singers and orchestra could be supplied to all subscribers who would have aerial wires on or near their homes. The transmission stations for such music would be tuned for an entirely different wave length from that used for any other form of wave telegraph or telephone transmission, and the inventor believes that by using four different forms of wave as many classes of music can be sent out as desired by the different subscribers.

At the present time, then, it would seem that there is a distinct commercial future for wireless telephony, but a conservative judgment would indicate that its use would be supplemental to existing wire circuit systems, and that the latter are not likely to be supplanted for many years to come by any form of radio-telephonic apparatus. It will occupy a new and large field for marine work, for military lines especially during war or maneuvers, for communication between islands, and for mountainous and sparsely settled districts, especially where temporary installations are desired, which can be installed on the shortest notice and maintained without specially trained operators.—*Review of Reviews.*

Telephone Girls of Manila.

Manila telephone subscribers feel that though living in what the average American believes to be a semi-barbarous land, the rest of the world has no "edge" on them in being served by comely maidens as "hello girls." The Filipino telephone operator comes from the best families of her land and takes her work more seriously than her fair-skinned sister of the Occident. She has her servant, who is also her chaperon, to accompany her to the office, carrying her lunch, and who calls to chaperon her back to the security of her home when the gong rings on her day's work.

The Spanish custom of never permitting an unmarried woman above the age of 12 years to leave the portals of her casa unaccompanied still prevails with both Spaniards and Filipinos of the better class, and their employment as telephone operators permits no relaxation of the watchful care.

The fact that the field of labor, aside from domestic service, for the Filipino girl is so limited, makes employment in this line especially desirable and much sought after by the daughters of the well-to-do Filipinos. Hence to be a "hello girl" in the Philippines is an honor carrying with it prestige and entry into the best society.

To serve as "central" in Manila, a girl must speak and understand English, Spanish and Tagalog, and some of them possess a working knowledge of Chinese, Japanese and other Oriental tongues.

The chief operator—an American woman—of the recently established Manila line, states that the Filipino girls employed as operators are very apt and intelligent and are rapidly developing a most satisfactory service. They receive, as beginners, a salary of 20 pesos ($10) per month, which is increased to twice that amount on their becoming proficient.

As the word hurry is unknown in the far East, so likewise it is often necessary for an impatient subscriber to curb his temper when telephoning. But the tones of the dulcet voiced operator, "Dhe lyne ees beesee, senor," soothes him to patience.

Telephones in Turkey.

"Up to a year ago," writes United States Consul Harris, "there was not a single city or town in the 800,000 square miles of Turkish possessions which could boast of a telephone system or of a central station for electric light or power purposes. Now Damascus and Beirut have their electric central stations, however queer it may seem that the former ancient city should lead in progress the important quasi-European cities of Constantinople, Smyrna and Salonica. Quite recently concessions were granted for electric light and traction in Constantinople, Salonica and Broussa. Smyrna, the second city in the empire, and perhaps the first in commerce and future prospects, seems to have no immediate future for electrical appliances, although perhaps no city feels more the need of them."

Telephony in Siam.

The Siamese minister of public works has received the sanction of the king to the proposal to acquire and install an entirely up-to-date telephone system in Bangkok. The system decided on is the central battery system. The installation will go to public tender. The minister is now engaged arranging for a new cable from Koh-Si-Chang to Sirachi with connection to Bangkok.

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Simultaneous Telephone and Telegraph

By Frank M. Slough and M. E. Taylor

THE maintenance of a toll line is practically the same whether used alone for telephone transmission or used for both telephone and telegraph service. The earnings, however, are considerably different, because the telegraph rental alone for one side of the telephone line is worth from $20 to $30 per mile per year. Thus, for example, a toll line one hundred miles long, equipped for composite circuits, is capable of earning from four thousand to six thousand dollars per year in addition to the toll revenue.

Both large and small toll line companies are equipping their toll switching stations and long distance telephone offices with equipment to operate simultaneous telephone and telegraph circuits.

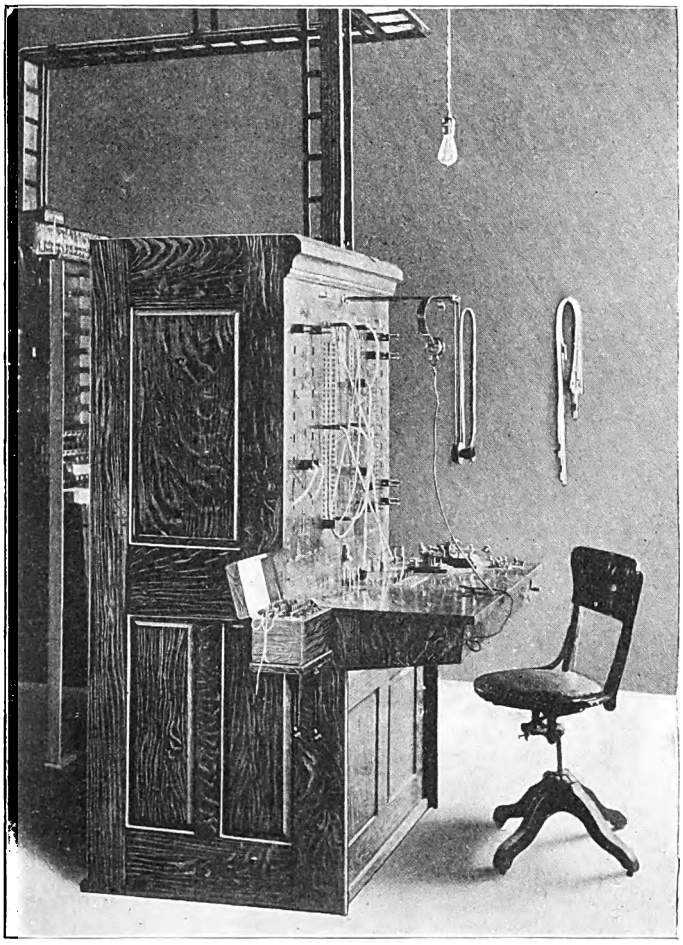

Figure 30—Test Board Equipment.

The United States Telephone Company, with general offices at Cleveland, Ohio, has established an exceptionally large telegraph business throughout the state of Ohio and adjoining states which it maintains by simultaneous telephone and telegraph circuits, handling a large portion of the Associated Press news and mining and broker business in that section.

While it is generally known that simultaneous telephone and telegraph circuits are being maintained, to some extent, among the Independent telephone toll line companies throughout the states, practically speaking, the service is yet in its infancy.

Where good toll lines are being maintained, there should be no reason for not equipping them for simplex or composite circuits. A question arises as to how the telegraph service given over a simplex or composite toll line compares with the ordinary telegraph circuit. In nearly all cases the composite and simplex toll circuits are much the preferable for the reason that an ordinary telegraph line is constructed of iron wire of high resistance, while the toll line is of copper well insulated from grounds. All connections are made mechanically and electrically good and the lines are of low resistance. There is no difficulty in operating a telegraph circuit over composite or simplex lines of 200 miles or more without the use of repeaters, providing there are but few offices connected. However, a case has come under our observation where one telegraph circuit is now in service which is operated over seven different sections of toll lines, which are connected for telegraph only with telegraph simplex coils. Fourteen

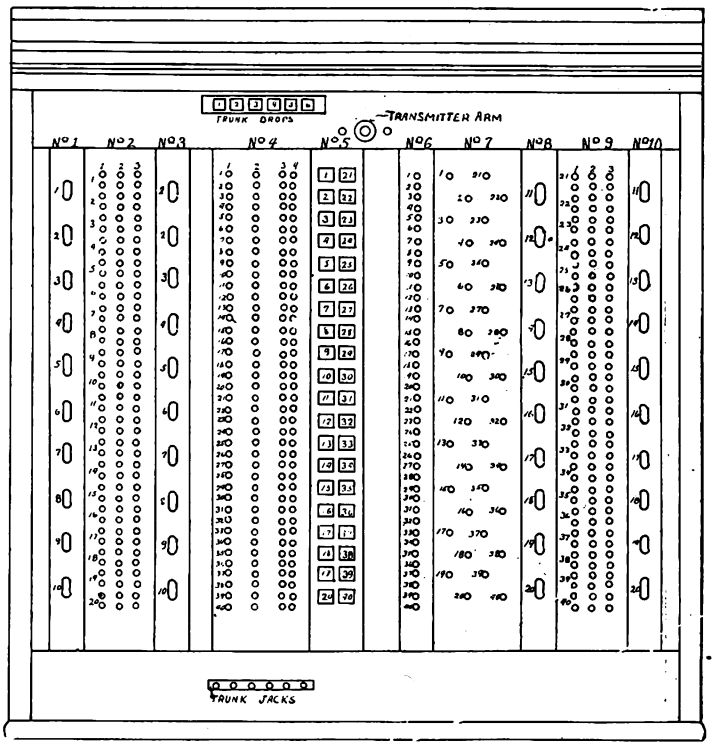

Figure 31—Arrangement of Test Board Apparatus.

coils are used for this circuit—a distance of 240 miles. This particular circuit is being worked with good results and without the use of repeaters, battery being furnished only at end terminal offices. The seven toll circuits are used as separate lines for intermediate toll service. With the use of repeaters at intermediate stations the signaling is greatly improved and great lengths of lines can be operated as in one continuous length with practically no depreciation.

In a previous number we described a few of the prevailing methods for equipping toll lines for testing circuits and small test boards. In this issue we will describe some of the more extensive methods of circuits and test board equipment.

Figure 30 illustrates a modern one-position toll board, constructed for 40 toll lines, 20 simplex or 40 composite circuits, 40 telegraph loops or repeater sets, 8 ground plugs, 40 battery connections, telephone and telegraph test circuits and wire chief's or intercommu-

nicating trunks. The jacks used for this type of equipment are of the individual type mounted in hard rubber panels. Six jacks comprise each toll line circuit, as shown in the line circuit, Figure 35.

Figure 33 shows a convenient arrangement for mounting the apparatus connected with the test board equipment and circuits. To the left on the mounting boards is shown an arrangement for fusing and furnish-

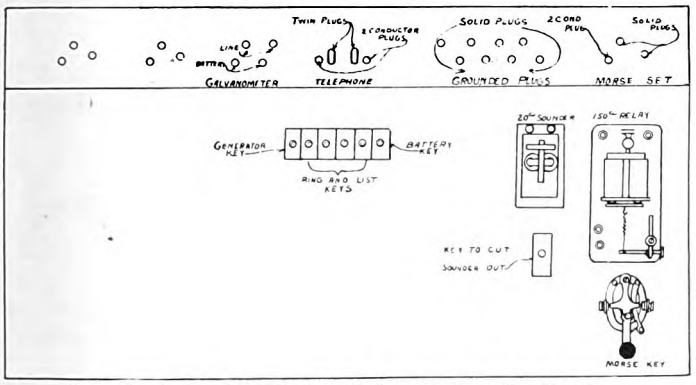

Figure 32—Arrangement of Apparatus on Key-Board.

ing battery for the telegraph circuits through different resistance lamps or resistant units, (the latter style is the more serviceable and gives the uniform efficiency), mounted in Edison keyless porcelain sockets. Immediately next to the resistance units are the telegraph simplex coils, while to the right of these are the high current arresters to which the incoming toll lines and trunk cables are connected.

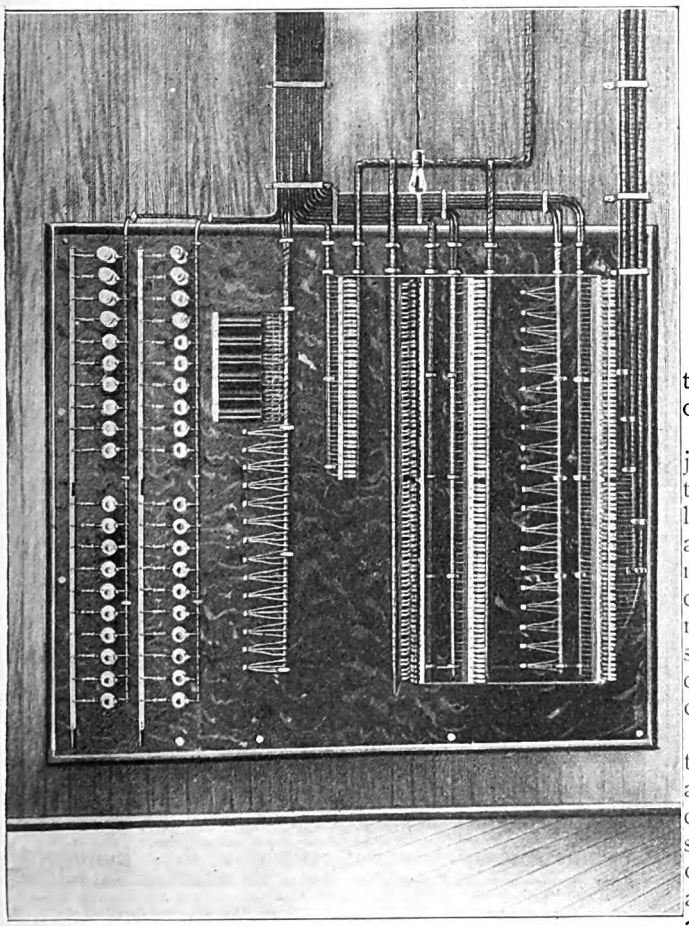

Figure 33—Arrangement for Mounting Apparatus.

The wiring of the Morse coils terminate on plugs (Figure 34), which are extended from the front of the test board as shown in Figure 40. The twin plugs connected to the line side or primary of the coils are located at the left of the toll line jacks in panels No. 1 and No. 8, while the plugs connected to the drop side or secondary of coils, terminate in panels No. 3 and No. 10, the leg connections of these coils terminating in panel No. 7.

All connections between mounting board and test board, or between test board and toll board, are made at the intermediate cross connecting rack in the ordinary method of cross connecting, using short lengths of jumper wire to cross connect the various terminals. For this purpose a flame proof wire is recommended as a precaution in a case of lightning and crosses with foreign power circuits. In this way connection can be made for composite or simplex circuits without changing the wiring or mechanical conditions of the test board.

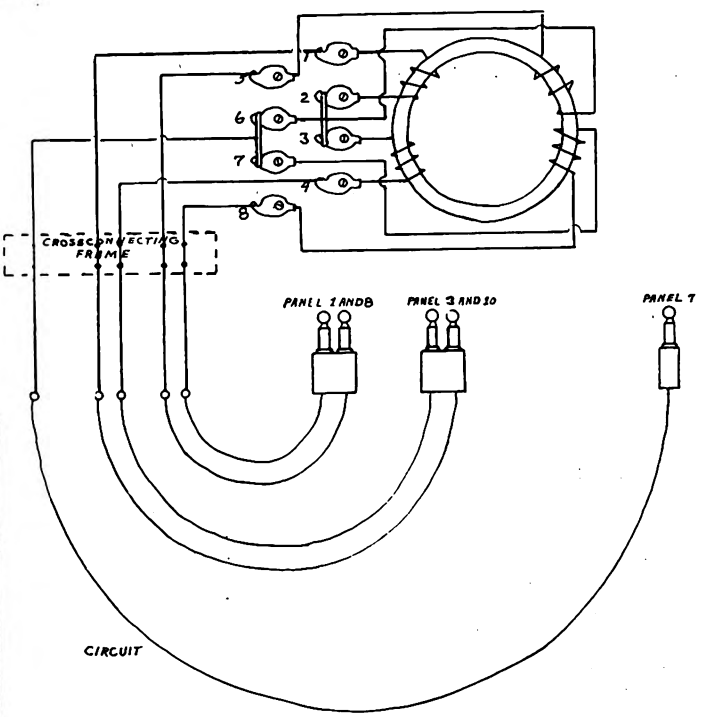

Figure 34—Morse Coil Circuit Connections.

Figure 35 shows a line circuit from the arresters on the mounting board through the test board to the long distance switching board.

The jacks marked No. 1 are the tip and sleeve line jacks. A twin plug placed in these jacks will discontinue all connections on the switchboard side, thus allowing the line to be tested direct. The line being separated as to tip and sleeve allows a careful test to be made and if either side of the line is in trouble the fact can easily be determined and tests and measurements made to locate the fault. Jacks No. 3 represent the switchboard connections disconnected, thus allowing a careful test to be made and the tip or sleeve side of the circuit to be ascertained.

The center jacks No. 2 are used for bridging in on the line without disconnecting either side of the circuit and at the same time notifying the toll operator that the circuit is in use at the test board by the busy signal shown in this circuit. This signal is usually a red lamp connected above the line jack and is also multipled above the line multiple jacks. This light should be rated about six volts higher than the power from which it is lighted, because it remains lighted during the entire time the line is in use by the wire chief or operator and the life of the lamp is greatly increased in this manner.

The jacks No. 2 are also used to test or call out on

the line when jacks No. 1 and 3 are in use for connecting Morse coils for telegraph service. The wire chief or toll board and test board intercommunicating trunks are used for the convenience of the operators for communicating trouble and for connecting up local trunks or toll stations to the test board for testing, etc., and is nothing more than the ordinary magneto line or toll circuit which can be connected to line circuits on the toll board. Figure 36 shows the wiring of the jacks terminated in rows 1, 2, 3, and 4 in panel No. 4. The differential wound drops are mounted in panel No. 5 and the jacks are located in panel No. 6. The advantage in connecting jacks, as shown in this drawing, is to permit the wire chief to connect his telegraph test set in series with any working telegraph line by inserting a two-conductor plug connected to his telegraph test set into jack No. 1. Connections with these jacks when made up for telegraph service is as follows:

A single cord with a solid plug at either end is placed in jack 3 and 4, which furnishes battery through the differential wound drop to one side of the Morse loop or to the repeater circuit. The opposite side of the loop or repeaters (which terminate in panel No. 6) is connected to the composite or simplex line by the use of the leg plug which terminates in panel No. 7 and is connected to Morse coil as illustrated in circuit drawing Figure 34.

Jack No. 2 is used to disconnect battery or for placing a ground plug for furnishing a ground connection instead of battery at this station. The differential wound drop shown in this illustration, and which is mounted in panel No. 5, is used to permit the telegraph sub-station to signal the wire chief when an occasion demands it. A differential wound drop circuit is shown in Figure 37. In this illustration it will be noticed that the current flowing in the circuit when the telegraph equipment is in operation neutralizes the winding of the drop and no signal is permitted.

When the telegraph operator wishes to call the wire chief he throws switch *S*, which in its operation first comes in contact with connecting posts 2 and 5, opening winding *A* of the differential wound drop and placing a ground on winding *B*, discharging the coil. The switch also connects posts 1 and 4, which opens winding *B* and

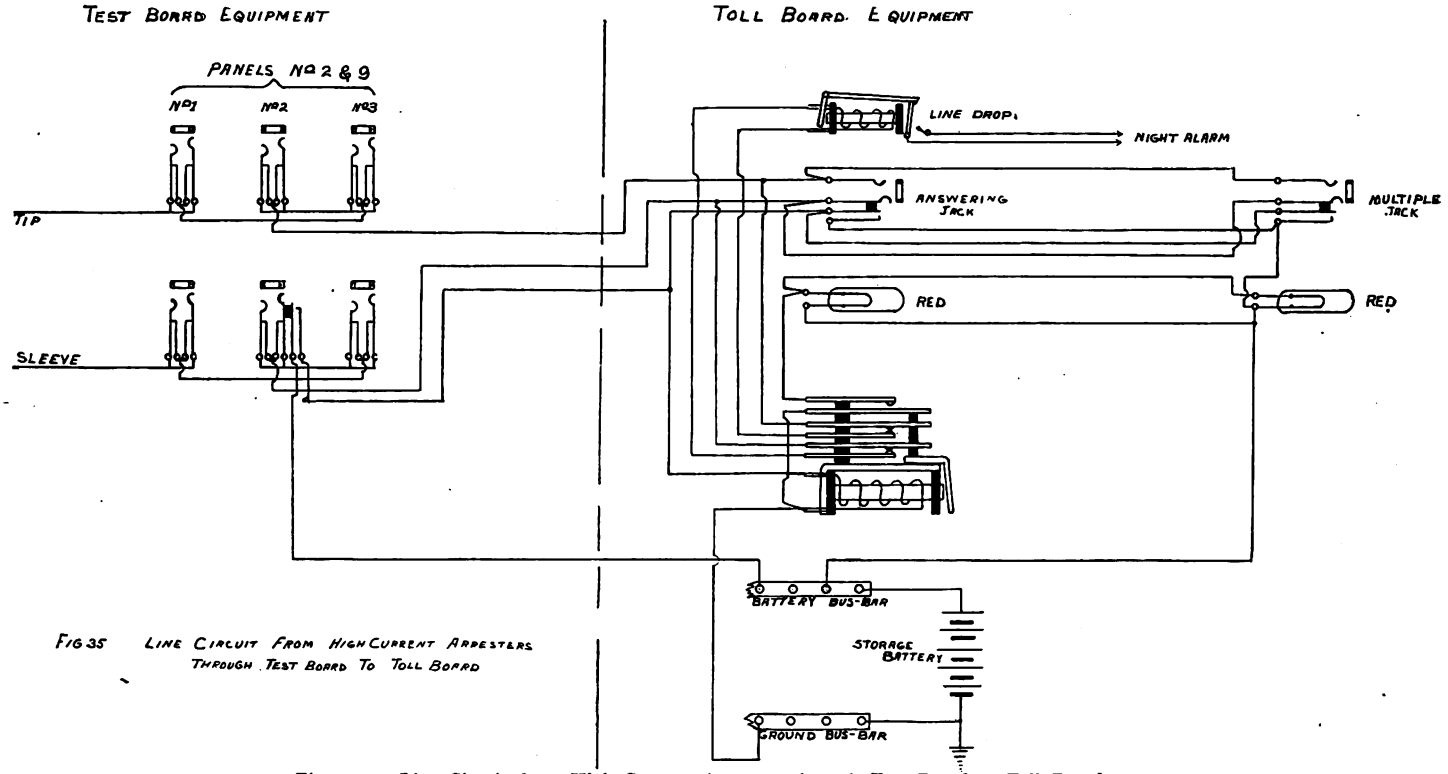

FIG 35 LINE CIRCUIT FROM HIGH CURRENT ARRESTERS THROUGH TEST BOARD TO TOLL BOARD

Figure 35—Line Circuit from High Current Arresters through Test Board to Toll Board.

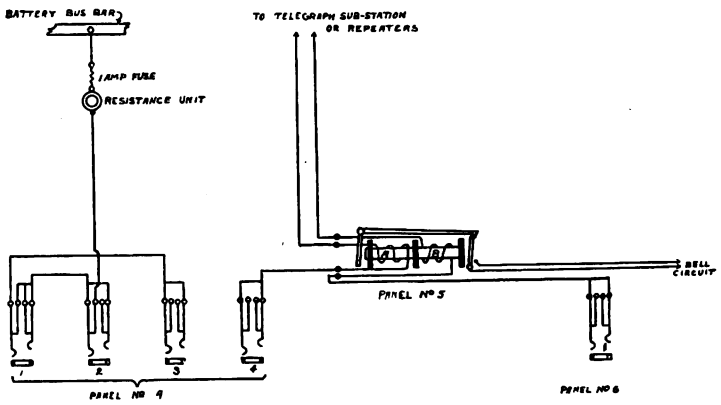

Figure 36—Circuit Arrangement of Panel, No. 4, 5 and 6.

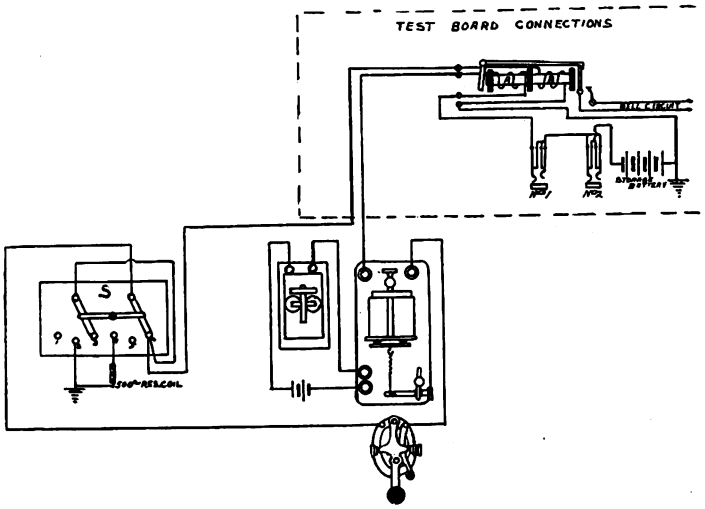

Figure 37—Differential Drop with Circuit Connections.

places winding *A* in series between battery, relay and a 500-ohm resistance coil to ground. This energizes the drop through winding *A*, which in turn closes a buzzer circuit or lights a lamp. When a relay is used, both a lamp and buzzer or bell is operated. The wire chief answers by inserting the two-conductor plug, which is connected to the telegraph test set into jack No. 1, thus

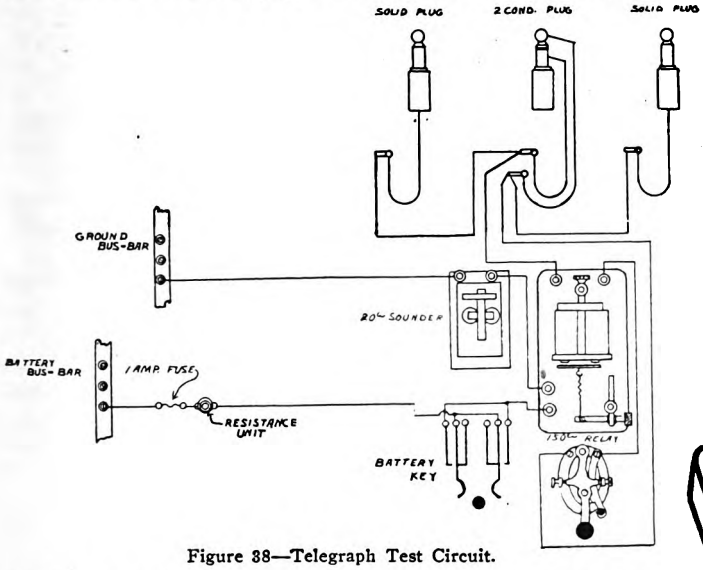

Figure 38—Telegraph Test Circuit.

placing the telegraph test set in series with the telegraph sub-station and line. By this method communication is transmitted. This drawing (Figure 36) represents the circuit connection of panel Nos. 4, 5 and 6 when cord connections are made between jack Nos. 3 and 4 for telegraph service.

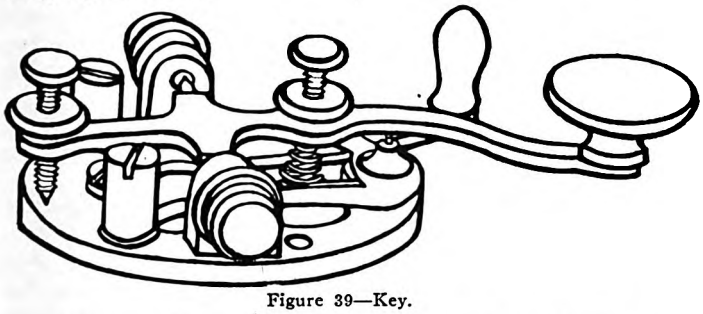

Figure 39—Key.

Figure 38 shows the telegraph test circuit, the equipment of which is shown to the right on the key-board in Figure 32. The equipment for this circuit consists of two solid plugs, one two-conductor plug, legless telegraph key, sounder, telegraph relay and a battery key. The object of the solid plug is to permit tests to

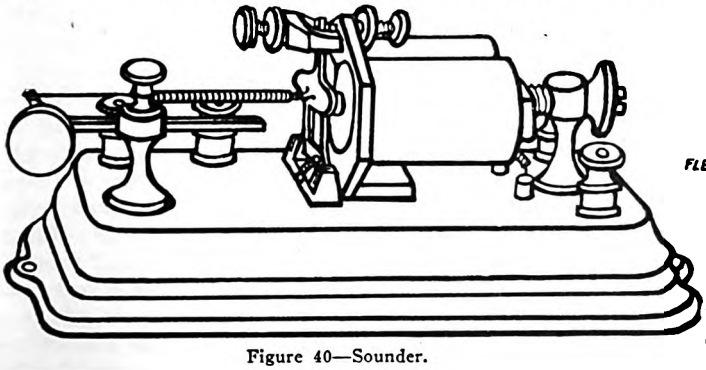

Figure 40—Sounder.

be made on lines for ground or battery leakages. For example, one of the plugs can be placed in the battery jack while the remaining solid plug can be inserted in the various line jacks in order. If a line is grounded the telegraph circuit will be completed and operate the relay. A test for battery leakage can be found in the same manner. This arrangement, alone, is well worthy of consideration, as every line on the test board can be tested in a few seconds.

The use of the two-conductor plug in this circuit has been explained in connection with answering or connecting in series with the telegraph sub-station, or for testing the service of through telegraph lines.

The key for connecting the sounder in the circuit

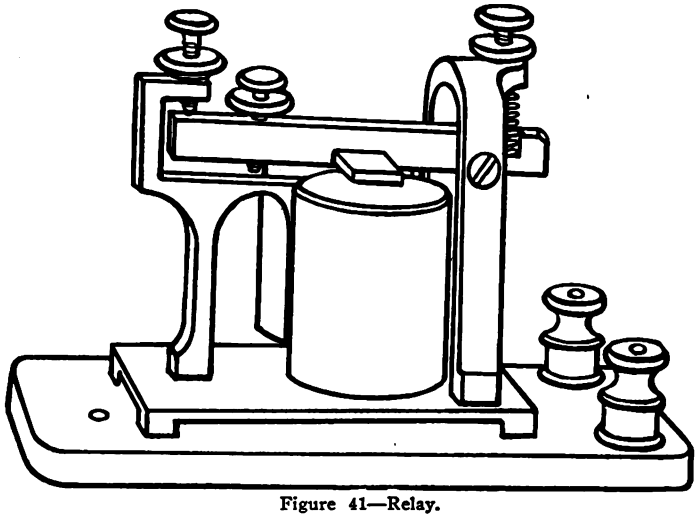

Figure 41—Relay.

is a very convenient method and is advisable on all test boards, for quite frequently it will be necessary to make a test on a telephone circuit during the operation of the telegraph relay. By using the key you will not interfere with the telephone testing, but with a sounder connected permanently you would greatly affect the telephone test. With the use of the key the sounder can also be connected or disconnected at will, without interfering with the telegraph service. The style of telegraph key,

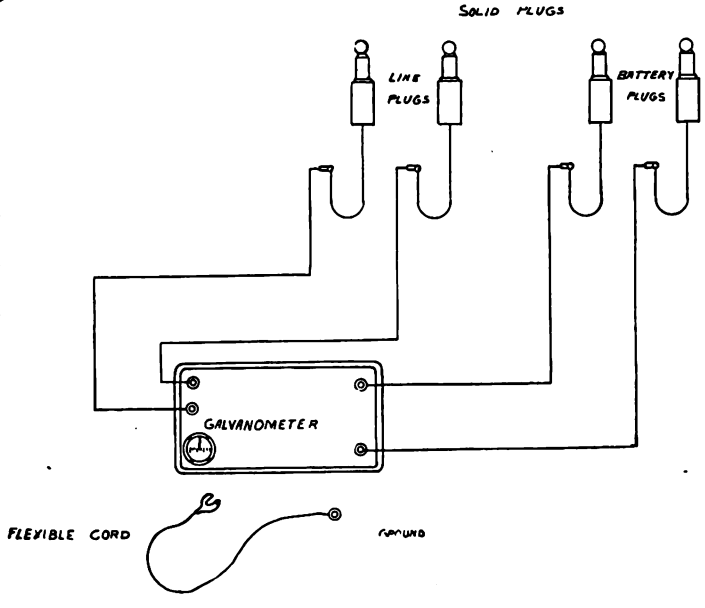

Figure 42—Galvanometer Wiring.

sounder and relay, used principally for this class of work, is shown in Figures 39, 40 and 41. The relay is of 150-ohm resistance, while the sounder should be of 20-ohm and if operated by storage batteries or direct current electric light mains, a resistance unit should be connected in series in every case, as shown in Figure 38.

A 4-ohm sounder is used when operated from a local battery. About .2 of an ampere of current is all

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that is required to operate the sounder. It is easy to determine the size of the resistance unit by Ohm's law.

For example: R=C÷E; E=110 volts of direct current; I=.2 ampere. Then R=(110÷.2)=550 ohms resistance. Sounder=20 ohms, or 550 ohms less 20 ohms=530 ohms required in the resistance unit.

For this equasion a 500-ohm resistance unit will answer as the difference in the fraction of an ampere in the sounder circuit and will not be noticeable. Units for this apparatus are made in standard sizes and arranged in the following ohms resistance: .15, .2, .3, .4,

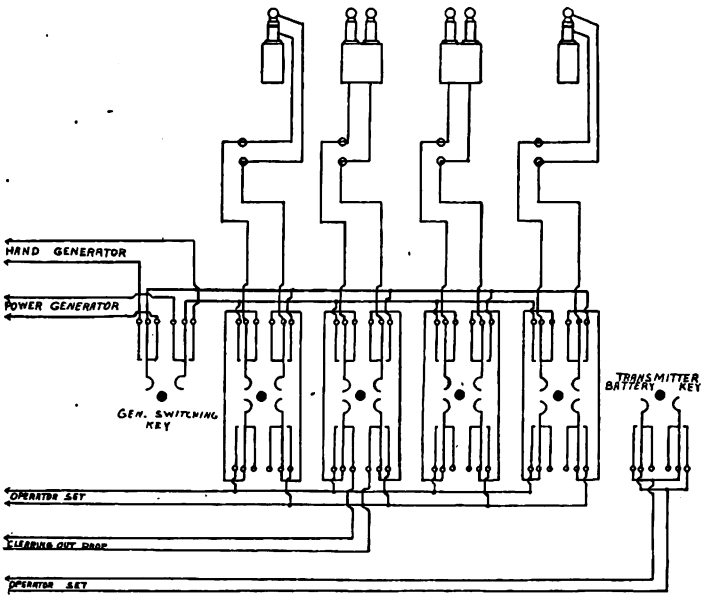

Figure 43—Wiring of Telegraph Cord Circuit.

.6, .9, 1.2, 1.7, 2.5, 3.5, 5, 7, 10, 15, 22, 31, 45, 62, 90, 125, 175, 250, 350, 500, 700, 1,000, 1,500, 2,000 and in thousands thereafter.

Thus, with the foregoing combinations of resistance units it is possible to get almost any resistance desired by connecting them in series or in parallel. With a 500-ohm unit in the circuit the sounder receives .21 of an ampere. The wiring of the galvanometer is shown in Figure 42. With this method of plug connections it is possible to get any desired condition for testing, be-

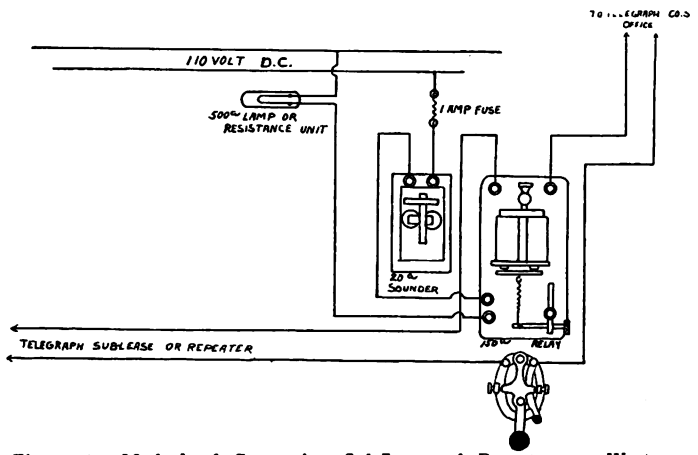

Figure 44—Method of Connecting Sub-Lease of Repeaters to Western Union or Postal Telegraph Company for Broker Service.

cause the arrangement makes it possible to get any desired electromotive force and with the use of the solid plugs one can be connected to ground while a second one is used for testing the line. All the usual forms of tests can be made with this method of plug connections.

Figure 43 shows wiring of telephone cord circuits and the arrangement of this equipment is shown in the key shelf drawing, Figure 32. The key to the left in Figure 43 is used to switch from power to hand generator current for testing. The transmitter battery key, located to the right, is used when testing for a slight noise on a toll circuit or when detecting a swinging high resistance ground, and to connect in on a busy circuit to determine the service given.

The two single two-conductor plugs and keys are used for connecting and testing on the trunk circuits, while the center keys, with twin plugs, are used for talking, ringing, and testing on toll line circuits. In order to give broker service, it is nceessary to secure or lease such service from the telegraph operating companies.

Figure 44 illustrates the wiring of apparatus for connecting such service with the repeaters or through the telegraph sub-lease to whom the service is given.

The sounder shown in the diagram is operated from 110 volt direct current electric light circuit by the use of a resistance lamp or resistance unit, connected in series in one side of the circuit and through a one-ampere used on the other side. In practice, a double pole double through electric light switch should be used to connect and disconnect both sides of the electric light connections.

Telephones in Japan.

In 1890 the Japanese government decided to undertake the building of telephone lines which were to be a government monopoly, and telephone service was first opened in Tokio and Yokohama in that year. By 1895 extensive developments had been made, the reach of communication including all important cities.

The system is under the control of the Minister of Communications, which has followed every important improvement in the telephone. Last year some two hundred million messages were sent, there being 500 public offices and 20,000 subscribers.

Telephone charges are fixed, as here, on the basis of the possible calls per year. A subscriber pays an extra charge for long distance calls.

To avoid all danger the government has begun to put its wires underground. In switchboard construction numerous devices have been tried as fast as they have been installed in European telephone stations. But the three principal kinds in use are the Standard telephone switchboard, the multiple telephone switchboard of the Western Electric Company, and the Man's telephone switchboard. These, with the exception of the second, are with certain modifications manufactured in Japan, and are even better than those which were first imported. The manufacture of telephones themselves has had a rapid development, until today it has reached a fair perfection.

Telephones for Forest Reserves.

Gifford Pinchot, chief of the forestry division of the United States Department of Agriculture, recently submitted to the house committee on agriculture a proposition which, if adopted, will have an important bearing upon the future of forest reserves. In the first place it is proposed to change the name to national forests, then to equip each with telephone lines, trails and cottages for use of rangers. Mr. Pinchot asks for $5,000,000 in all for this purpose, and he assured the committee that the expenditure will prove of great benefit to the service, and that it will result in securing far better cash returns from national forests than is now received. The committee appeared to be favorably impressed with the proposition.

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The Law and the Telephone

By George H. Murdoch, Jr.

RISKS OF TOLL OPERATOR.—In an action by a Miss Cahill against the New England Telephone & Telegraph Company, for personal injuries received by her while at work in the employment of the defendant as toll operator, at its telephone exchange, in the city of Lynn, a verdict was directed by the trial court in favor of the defendant. This has just been reversed by the Supreme Judicial Court of Massachusetts in an opinion reviewing the facts in which it holds that the case should have been submitted to the jury as follows:

"The notice required by Revised Laws, chapter 106, section 75, not having been given the count under the statute was waived and the case went to trial on the counts at common law. These in substance alleged that the defendant negligently failed to furnish a safe and suitable place in which she could perform her work, and also had failed to maintain wires, appliances and apparatus in proper condition, and carelessly had allowed them to become defective, whereby the plaintiff while in the performance of her service was injured by receiving a severe shock of electricity. The questions for decision are whether there was evidence of the defendant's negligence, and of the plaintiff's due care, requiring the submission of the case to the jury. The testimony which is reported at length shows that the office used as an exchange was furnished with the usual equipment of wires, transmitters and switchboards, and that under normal conditions neither the instrumentalities, nor the place where they were installed and used were unsafe. But being charged with electricity, if either the installation or insulation was defective, then upon the wires or the transmitters becoming overloaded, the use of the apparatus might be rendered dangerous to the operator. By entering the defendant's employment the plaintiff assumed the ordinary risks of nervous annoyance and irritation that might be reasonably connected with the performance of her duties, but this did not include shocks from an electric current which could be found to have caused pronounced bodily prostration, even if the degree of voltage was not sufficiently high to imperil life. There was evidence that on the night before and during the morning of the day of the accident the plaintiff had reported to the chief operator that while at work on the sixth switchboard she had received, at times, sensations not before noticed, although she previously had used this switchboard a part of every day for at least a week, and that these sensations, while not producing a shock, caused a 'jarring and a grinding or rumbling in her ear' which at times caused her head to ache. While at work she sat in front of this switchboard attending to calls for the connection of local subscribers with places out of town, and wore upon her head, held in place by a steel spring, a light telephone receiver connected with the switchboard by a cord. Upon receiving a call in which she heard the subscriber state the place with which he wished to be connected, there followed, according to her testimony, a sensation of 'shocking and grinding * * * * and then my head commenced to ache, and then my side hurt me, and then my arms kind of tightened.' In response to the question, 'Did you lose consciousness then?' she replied, 'Well, I don't think I did wholly.' It appeared from the testimony of one of the defendant's chief operators that if complaints were received that shocks of more or less severity were experienced by employes it was his duty to examine into the cause, and remove the difficulty if it could be done, or if not 'to report the trouble to headquarters.' Notwithstanding there was evidence that disagreeable and annoying noises from the clicking, ringing or buzzing of the apparatus, as well as slight shocks, were neither uncommon nor dangerous, none of the witnesses testified that these occurrences included the passing of a current of the force described, and it could have been found that the shock received by the plaintiff was not only unusual in severity, but dangerous, and would not have taken place if the apparatus had not been defective. For some time prior to the accident there had been complaints from the plaintiff and other employes to the principal operators that this switchboard, or the system controlling the electric current, was not working properly, and attempts had been made by them to find and remedy the difficulty. The making of occasional repairs and replacements required by the daily use and wear of the system could be delegated to servants, but it was the duty of the defendant not only to provide suitable apparatus, but thereafter to maintain it in a state of proper repair so that it could be safely operated. A failure to perform this duty shown by the defective condition described would be evidence of negligence, and beyond proof of a defect existing in the apparatus of which the defendant knew, or in the exercise of due diligence ought to have known, the plaintiff was not required to go. If the shock was caused either by a want of repair or a proper adjustment of the different parts, the question of defendant's negligence was for the jury to determine.

"The argument of the defendant that the injury might have been caused by the negligence of fellow servants, either from a failure of the chief operator, or of the switchboard inspector to perform their duty, or that of a workman, who, upon being directed to repair the defect, had performed his work carelessly, or by some wrongful interference with the system by a stranger, is not relevant, as the defendant offered no explanation of this character concerning the accident which the jury could have found was of such a nature that it would not have occurred unless the defendant had permitted the apparatus to become defective.

"It is further contended that by continuing to use the switchboard after she had reason to anticipate that something was wrong in the mechanism, she assumed by her conduct the risk of any subsequent injury. If after reporting the previous disturbances to those who had been placed by the defendant in charge she continued at work, whether she knew and appreciated the danger, was for the jury."—79 N. E. 821.

NEGLIGENT HANDLING OF MESSAGE.—Dye Allen put in a long-distance call for his brother-in-law, Burton, with the Cumberland Telephone Company, to inquire about the condition of Burton's sick wife. The call was made early in the morning and the messenger's fee demanded and paid by Allen to get his party to the telephone. The agent of the company received the call and sent a messenger to notify Burton that he was wanted at the telephone. The messenger did not report back to the exchange, and a second messenger was sent out, who reported that he could not find the party. The first messenger boy some time during the afternoon told some children at the Burton house that some member of the family was wanted at the telephone, which fact was com-

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municated to Burton about 6 o'clock in the evening. Allen never succeeding in getting telephone communication with his brother-in-law, and brought suit for damages, and the jury awarded him $250, and the company appeals. No actual damage is claimed or proven, and the whole question to be determined is whether, under the state of case shown by the record, punitive damages were recoverable.

The Supreme Court of Mississippi in reversing the case said in part:

"There is nothing which shows willfulness, oppression, or willful disregard of the rights of appellee, or any other willful wrong. In the case of *Vicksburg Co. v. Marlett,* 78 Miss. 873, 29 South. 62, the court has said: 'Punitive damages may be recovered only in cases where the acts complained of are characterized by malice, fraud, oppression of willful wrong, evincing a disregard for the rights of others. There must be some element of one or more of the qualities or properties named, relating to the acts made the ground of the action, before exemplary damages may be inflicted.' The testimony in this case utterly fails to establish any element in the conduct of appellant, tested by the above rule, which would warrant the imposition of exemplary damages, and the instruction given by the court on this line was erroneous.

"The testimony undoubtedly shows that appellant was somewhat careless in seeing to it that the call was delivered to Mr. Burton; but it is equally certain that there was no willful or intentional wrong intended. The measure of damages in this case is actual damage sustained by appellee, and the court erred in refusing to instruct the jury that appellee could only recover his actual damage."—42 So. 666.

CONFLICT FOR RIGHT OF WAY.—The Batesville and Winerva Telephone Company was a corporation organized under the laws of Arkansas and owned the telephone line through the counties of Independence, Izard and Baxter, and constructed its line on the north or east bank of the White river from Syllamore to Penter's Bluff, Independence county. During the year of the construction of this particular part of the line, the White River Railway Company began the construction of its line of railway from Penter's Bluff to Syllamore. The railroad company constructed its roadbed largely upon the ground where the telephone line was located, and in its construction willfully, intentionally and unlawfully cut down, tore down, and took up a large number of the telephone company's poles, and tore down and destroyed the telephone wires for the greater part of the distance between Penter's Bluff and Syllamore. The telephone company commenced suit against the railway company for $3,000 actual damages and asked for a judgment in the sum of double that amount under the statute. The railway company disclaimed intent and willful wantonness on its part by setting up that the damage done was the acts of its independent contractor; further alleged that it surveyed its line of road over the line on which was built the telephone system, and had staked off its right of way and was in good faith proceeding to build its line of railroad before the telephone line was built; that, after it had so appropriated said line, the telephone company built its line over the survey with full knowledge and notice of the right and claim of defendant and subject to same. A judgment for the telephone company obtained in the trial court has just been affirmed by the Supreme Court of Arkansas which held:

The employer is liable for injury to a third person from work of an independent contractor necessarily resulting from the work contracted for.

Under Kirby's Digest, Section 6569, providing that a railroad company before constructing part of its road shall make and file in the office of the clerk of the county court a map and profile, it is without authority to clear the way before such filing, and so is liable for damages from its destruction of the line of a telephone company in so clearing the way, though it surveyed its line of road before the telephone line was constructed, the making of the survey giving it no right in the land.—98 S. W. 721.

USE OF STREETS.—The telephone company, holding a franchise from a village authorizing the placing of poles in the streets, cannot occupy land forming part of a street, owned by a citizen and subject only to those easements arising from a dedication of the street, without the consent of the owner and against his wishes, and without having acquired the right by condemnation.—*Powers v. State Line Telephone Co.,* 102 N. Y. S. 34.

Virginia Independents Hold Convention.

The first annual convention of the Virginia Independent Telephone Association was held at the Lorraine hotel, in Norfolk, May 21. While the attendance was not large, companies from all over the state were represented, and a most interesting and enthusiastic meeting resulted. The principal question for settlement involved the matter of completing long distance toll lines. The discussion ultimately took the form of a resolution which was submitted to a committee appointed by the president, who instructed that it should work out the best ways and means whereby these necessary lines could be built, and report at a second meeting to be held in Norfolk within the next few months. During the interim, between the meetings, the committee will canvass the state in the interest of the proposed plan and there is little doubt but that Virginia will soon be connected by long distance toll lines with similar lines of other states.

The shield, which has become the emblem of Independent operators, was adopted by the convention, and it will henceforth have a prominent place on all of the printed matter of the member companies. W. N. McAnge of Suffolk was named as delegate and F. W. Davie of Lawrenceville alternate to the International convention.

The following officers were elected: Albert Parlett, president, Bristol; F. F. Marbury, first vice-president, Alexander; W. N. McAnge, second vice-president, Suffolk; B. L. Fisher, secretary and treasurer, Rocky Mount.

Executive committee: C. Fred Bonney, Norfolk; George B. Keezle, Keezletown; Albert Parlett, Bristol; W. N. McAnge, Suffolk; F. W. Davie, Lawrenceville.

New California Toll Line.

The Home Telephone and Telegraph Company of Santa Barbara county, California, is extending its lines north to Santa Maria, with exchanges at the latter place, Los Alamos, Los Olivos, San Ynez and Lumpoc. The line will form a ninety-mile link in the long distance line from Santa Barbara to San Francisco. It is an extension that has long been needed by the people in the northern part of the county, and more especially by the oil well operators, who have hitherto been dependent upon the Sunset Telephone and Telegraph Company, with its miserable service, for local and long distance communication.

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Roberts' Lock-Out System

By Nathanial D. Featherstone

THOSE interested in the telephone business, and particularly those connected with the operation of exchanges, whether large or small, have long felt keenly the need of a party line system which would give the limited user practically the same exclusive service as if he were served by an individual line.

As everyone knows, the principal investment necessary to provide facilities for telephone service is that required to produce the telephone line. In most cases the cost of instruments and apparatus is small in comparison with the cost of the line. By far the greater number of subscribers are those who use their instruments a comparatively small number of times a day, and to maintain an expensive telephone line for the exculsive use of one such subscriber who will use it but a few minutes each day is on its face an economic waste. As a result, where individual line service is practiced exclusively, one of two things must be true; either the average subscriber pays more for his service than he should, or else the operating company sells the service for less than it costs, or at best for an insufficient profit. Both of these conditions are unnatural and can not be permanent.

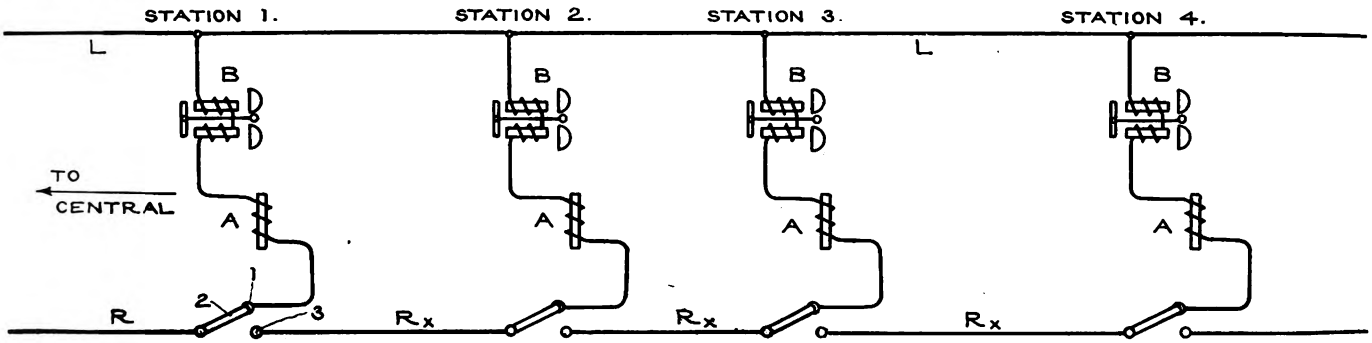

Figure 1.

The party line method of giving service, by which a single line is made to serve a number of subscribers, offers a solution to this difficulty, but the party line as it has existed up to the present time carries with it so many undesirable features that it has come into disfavor. These undesirable features work to the detriment of both the user of the telephone and the operating company.

One of the serious objections to the ordinary party line service is the fact that it affords no degree of privacy to the user. One might as well shout his information from the house-top as to attempt to convey it in private over an ordinary party line. So widespread is the so-called practice of "rubbering" that people who would blush at the idea of eavesdropping or listening through a keyhole will not hesitate to listen in on the wire whenever conversation between others is going on.

The ability of anyone to listen to the conversation of others on a telephone line is objectionable from other standpoints than that of privacy. Whenever a number of subscribers on a line take down their receivers, the voice currents which otherwise would pass only through the receivers of the two parties in conversation is divided up among all the parties, and a distinct loss of transmission is caused. It is frequently true that where a long-distance connection is involved the transmission is thus weakened to such an extent as to make communication impossible. Again, the large number of receivers thus caused to be bridged across the line frequently make it impossible to properly signal between the stations, because the signaling current leaks from one side of the line to the other through the receivers instead of passing on to the distant bell which it should operate.

Still another very serious factor is brought into existence by this improper use of the line. The local batteries at each station are caused to run down very much faster than would be the case if the subscribers only concerned themselves with the calls that were meant for them. In rural communities especially it is not uncommon for people to sit for hours every evening with the telephone receivers at their ears, listening to all that is going on. A few such drains on the local battery will often render the battery practically useless, with the result that the management is compelled not only to supply new cells, but perhaps to pay for the time of a man and a team to drive many miles in the country at all times of the year to put these in.

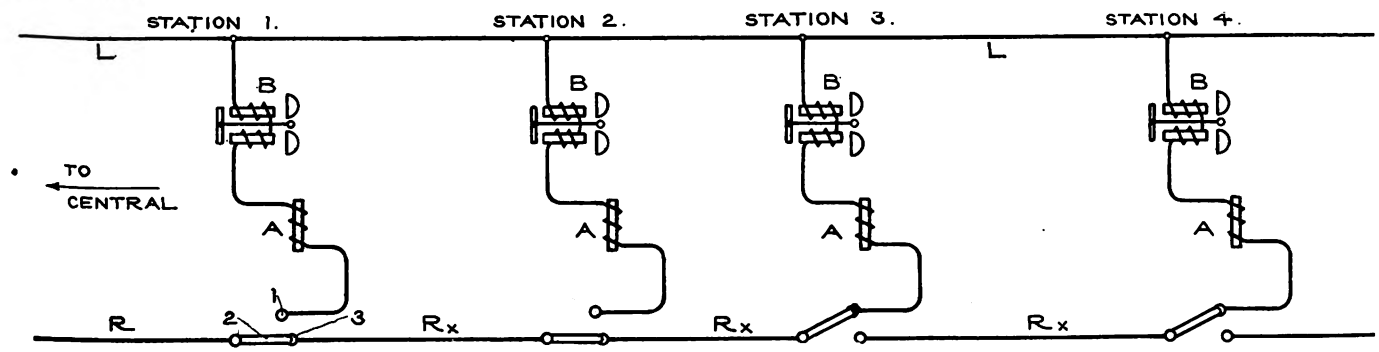

Figure 2.

Many attempts have been made to remedy these very obvious disadvantages of the party line by producing what

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are commonly called lock-out systems. These, as their name implies, employ such an arrangement of parts that when the line is in use by any two parties, all other parties are locked out from the circuit and can not gain access to it until the parties who are using it are through. System after system for accomplishing this purpose has been announced, and some of them have been recognized as de-

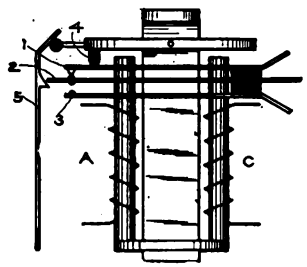

Figure 3.

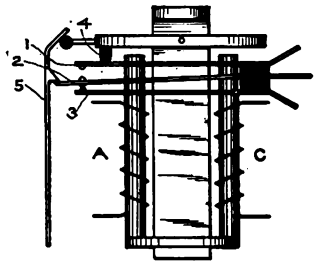

Figure 4.

sirable. These attempts, however, have all necessitated the use of rather cumbrous moving parts at each telephone; usually a system of pawls, ratchets and springs and a degree of complexity that was wholly unwarranted. As a result lock-out systems in the past have introduced so many undesirable features as to seriously affect the smooth operation and reliability of the system.

In addition to the complexity, the ratchets, pawls and springs and the poor mechanical design, lock-out systems heretofore, even when performing their functions as intended, have been so inflexible in their operation as to bring about intolerable conditions. To illustrate this, it has been possible for one party to secure the use of the line in such a way that no one else could use it for hours. Another subscriber on the line would be wholly unable to make a call, even in case of such an emergency as fire, accident or serious illness. Obviously, for this reason, no lock-out system can succeed if any subscriber is thus able to tie up the line, either through thoughtlessness, selfishness or malice.

Such was the condition in the party line telephone field, among both Independent and Bell companies alike, at the time when the Homer Roberts selective lock-out system was produced. This system operates in a novel manner, presents many interesting operating features, employs no pawls, ratchets or marginal adjustments at the sub-stations, and does not operate on the step-by-step principle in the ordinarily accepted meaning of that term.

The method employed in the Roberts system by which the selective ringing of subscribers is accomplished is particularly interesting and is based on a principle which we believe has not been used before in telephone practice. Primarily the Roberts system is selective-ringing, but the very means which brings about the condition for ringing any subscriber's bell to the exclusion of all others brings about at the same time a condition by which that subscriber only may talk. Furthermore, when a subscriber originates a call, the same operation by which the operator answers that call serves at the same time, and without further complication, to lock that subscriber on to the line and to leave all the others locked off.

The locking out of all subscribers but the one talking does not, however, mean that the subscribers so locked out are helpless. It is always within the power of the operator to prevent a subscriber from monopolizing the line in an unfair manner, and it is always within the power of the subscriber, even though he is locked out, to convey to the central office an emergency signal, the sending of which will not interfere at all with the subscribers who may be using the line.

In this system there are no tuned bells, there are no positively and negatively polarized bells bridged to ground on each side of the line, and none of the other methods by which selective signaling has been accomplished on party lines. Instead of this, each instrument on the line is exclusively brought into operative relation with the line, and then removed from such operative relation until the subscriber wanted is connected, at which time all of the other instruments are locked out and the line is not encumbered by any bridge circuits at any of the instruments that are not engaged in the conversation. Furthermore, in the selecting of a subscriber, or the ringing of his bell, there is no splitting up of current among the magnets at the various stations as in ordinary practice, but the operating current goes straight to the station desired and to that station alone where its entire strength is available for performing its proper work.

This sounds almost revolutionary in telephone work, and it is astonishing how simple are the means by which this method of operation is secured. In order to understand the system it may be stated at the outset that one side of the metallic circuit line is continued as in ordinary practice, passing through all of the stations as a continuous conductor. The other side of the line, however, is divided into sections, its continuity being broken at each of the subscriber's stations. In order to illustrate this, the diagram of Figure 1 has been prepared. This is intended to show in the simplest possible way how the circuit of the line may be extended from station to station in such manner that only the ringer of one station is in circuit at a time. The two sides of the line, *R* and *L* (indicating "Right" and "Left," respectively), are shown in this figure, and it will be seen that

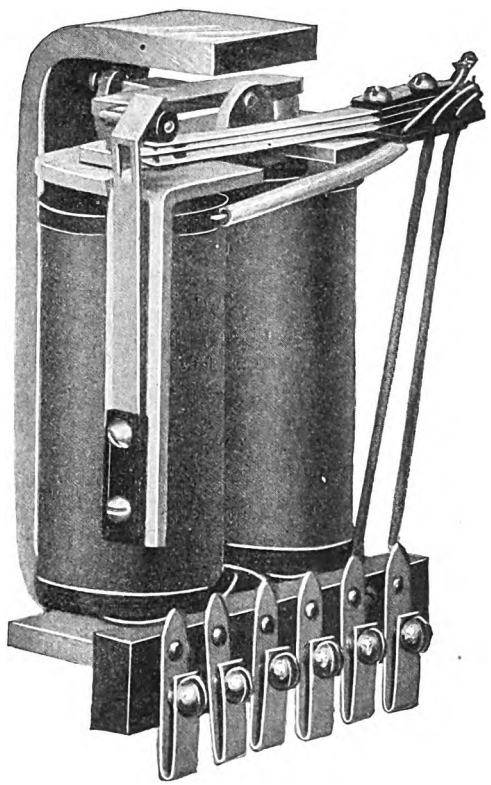
Figure 5.

limb *L* extends from the central office on the left to the last station on the right without a break. The limb *R*, however, extends to the first station, at which point it is cut off from the extension *Rx* by the open contacts of a switch. For the purpose of simplicity this switch is shown as an ordinary hand switch, but as a matter of fact it is a part of a relay, the operating coil of which is shown at *A*. just above it, in series with the ringer *B*.

Obviously, if a proper ringing current is sent over the metallic circuit from the central office, only the bell at station *1* will operate, since the bells at the other stations are not in the circuit. If by any means the switch lever *2* at station *1* were moved out of engagement with contact *1* and into engagement with contact *3*, it is obvious that the bell of station *1* would no longer be in circuit, but the limb *R* of the line would be continued to the extension *Rx* and the bell of station *2* would be in circuit. Any current then sent over the circuit of the line from the central office would ring the bell of this station. In Figure 2, the switches of both stations *1* and *2* have been thus operated, and station *3* thus placed in circuit. Inspection of this figure will show that the bells of stations *1*, *2* and *4* are all cut out of circuit and that therefore no current from the central office can affect them.

In order to understand just how these switches of Figures 1 and 2 are operated in practice, reference is made to Figures 3, 4 and 5. These figures show in diagram and perspective the line relay by which the functions of the switch lever *2*, indicated diagrammatically in Figures 1 and 2, are performed. Referring to Figure 3, which shows the line relay in its normal position, it is seen that the framework of the device resembles that of an ordinary polarized ringer. Under the influence of current in one direction flowing through the left hand coil, the armature of this device depresses the hard rubber stud *4*, and the springs *1*, *2* and *3* are forced downwardly until the spring *2* has passed under the latch carried on the spring *5*. When the operating current through the coil *A* ceases, the pressure of the armature on the spring *1* is relieved, allowing this spring to resume its normal position and spring *3* to contact with spring *2*. The spring *2* can not rise, since it is held by the latch *5*, and the condition shown in Figure 4 exists. It will be seen that the spring *2* has in this operation performed just the same function as the switch lever *2* performed as described in connection with Figures 1 and 2. An analysis of this action will show that the normal contact between the springs *1* and *2*, which contact controls the circuit through the relay coil *A* and the bell *B*, is not broken until the coil *A* is de-energized, which means that this relay is effective until it has accomplished its work. It is absolutely impossible, therefore, for this relay to cut itself out of circuit before it has caused the spring *2* to engage under the latch *5*.

If current of the proper direction were sent through the coil *C* of the relay, the opposite end of the armature would be pulled down and the projection shown at the left-hand end of the armature would bear against the bent portion of the spring *5* in such manner as to cause the latch of this spring to release the spring *2* and thus allow the relay to assume its normal or unlatched position.

A good idea of the mechanical construction of this relay may be obtained from Figure 5. When it is considered that the entire selecting function of the Roberts system is performed by such a simple piece of apparatus at each station as this relay, a fair comparison will be had of the relative simplicity of the mechanism of this system as compared with that of the other lock-out systems employing step-by-step devices with their complicated ratchet mechanisms.

The diagram of Figure 6 shows a four-station line, the circuits being given more in detail than in the diagrams of Figures 1 and 2.

It will be noticed that the ringer *B* and the relay coil *A* at the first station are bridged across the sides of the line leading to the central office. In like manner the bell and relay magnet *B* and *A* are bridged across the two limbs of the line leading into each succeeding station, but this bridge at each of the stations beyond station *1* is ineffective, because the line extension *Rx* is open at the next station nearest the central office.

In order to ring station *1* it is only necessary to send out ringing current from the central office. This current is in such direction as not to cause the operation of the relay, although it passes through the coil *A*. If, on the other hand, it is desired to ring station *2*, a preliminary impulse would be sent over the metallic circuit from the central office, which impulse would be of such direction as to operate the relay *A* at station *1*, but would not operate the bell at that station. The operation of the relay *A* at station *1* causes the spring *2* of this relay to engage the spring *3*, thus extending the line on to the second station. After the spring *2* at station *1* has been forced into contact with the spring *3* it is caught by the latch of the spring *5* and held mechanically. When the impulse from the central office ceases the spring *1* resumes its normal position, thus breaking the bridge circuit through the bell at that station. It is apparent now that the action of coil *A* at station *1* has made the relay powerless to perform any further action, and at the same time the line has been extended on to the second station. A second similar impulse from the central office will cause the relay at station *2* to extend the line on to station *3*, and at the same time break the circuit through the operating coil and the bell at station *2*. In this way any station may be picked out by sending the proper number of impulses to operate the line relays of all the stations between the station desired and the central office, and having picked out any station it is only necessary to send out ringing current from the central office, which current is in such direction as to ring the bell but not operate the relay magnet.

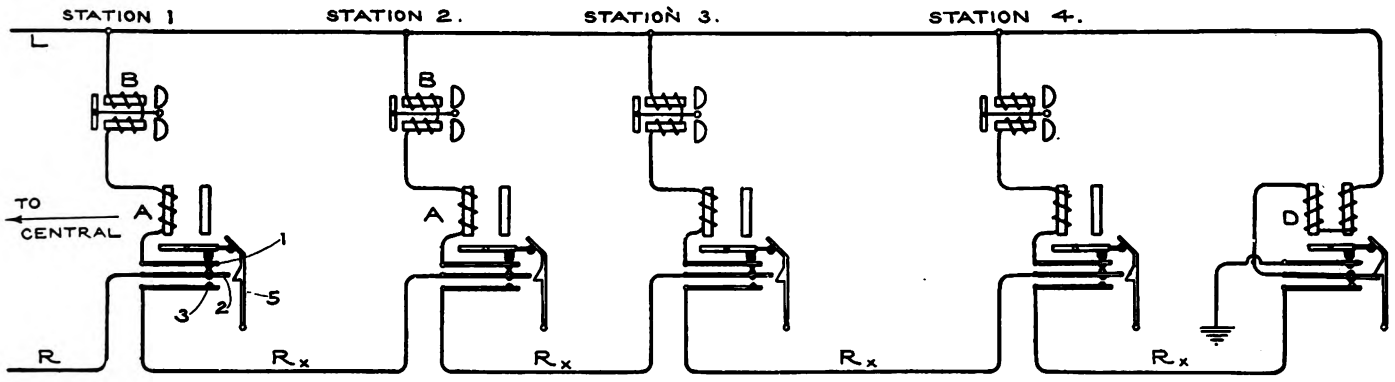

Figure 6.

In Figure 7 a four-station line such as is shown in Figure 6 is illustrated, but the condition shown is that existing when two preliminary impulses have been sent over the line, which operated the line relays at stations 1 and 2 in the order mentioned. The action of these relays continues the line so as to include the bell of station 3, thus making the circuit of Figure 7 correspond to that indicated in the simpler diagram of Figure 2.

Some of the advantages of this method of operating may now be understood before proceeding further with the description.

Since only one bell and one relay are in circuit at any one time, it is obvious that all of the current that passes over the line is effective in operating a single bell or relay only. There is no splitting up of the current among a large number of bells as in the bridging system, which, as is well known, sometimes so greatly reduces the current effective for each bell that it is with great difficulty that they are made to respond. It will be noticed that there are no leaks or shunts of any kind about any of the apparatus that is being operated, and therefore all the energy available is applied directly to the piece of apparatus at the time it is being operated. By this means a very much greater surety of action may be attained, and the adjustment of the various pieces of apparatus may be made with much less delicacy than is required where many pieces of apparatus must necessarily be operated in multiple.

actly balances the other. As is well known, this construction results in the equivalent of placing a low ohmic resistance without any self-induction in the line, the presence of which produces no appreciable effect upon the transmission. The talking qualities of the line are therefore those of an ordinary standard metallic circuit line.

The statement of operation so far given discloses the general method of building up the line in sections in order to choose any party and of again breaking it up into sections when the conversation is finished. It has been stated that the same operation which selects the party wanted also serves to give that party the use of the line and to lock the others off.

That this is true will be understood when it is stated that the ringer is of such construction that when operated to ring the subscriber wanted, it also operates to unlatch a set of springs similar to those shown in Figures 3 and 4, this unlatching causing the proper connection of the subscriber's talking circuit across the limbs of the line, and also closing the local circuit through his transmitter. The very first motion of the bell armature performs this unlatching operation, after which the bell behaves exactly as an ordinary polarized biased ringer. During the ringing, there is no incumbrance whatever on the movement of the bell armature or its tapper.

The construction of this ringer is interesting and is

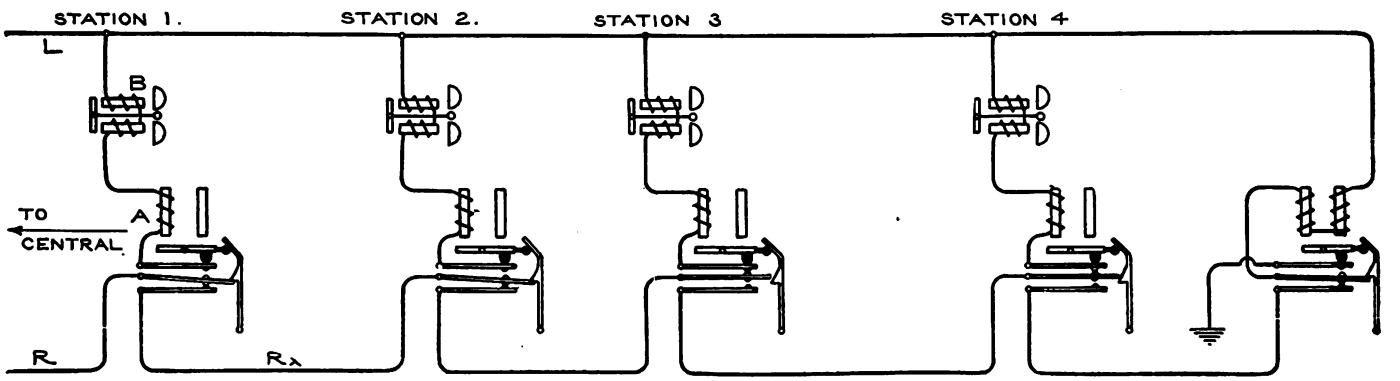

Figure 7.

The method of unlatching the relays has been briefly referred to. After a connection has been established with a station in the manner already described, the operator may clear the line when it is proper to do so by sending impulses of such a nature as to cause the line relays of the stations beyond the one chosen to operate, thus continuing the circuit to the end of the line. The operation of the line relay at the last station brings into circuit the coil *D* (Figures 6 and 7) of a grounding device. This is similar to the line relay, but it holds its operating spring in a normally latched position, so as to maintain the continuity between the end of the limb *L* and the last line extension *Rx*. The next impulse following over the metallic circuit passes through the coil *D* and causes the operation of this grounding device which, as will be seen, grounds the limb *L* of the line through the coil *D*. This temporary ground at the end of the line makes it possible to send an unlocking or restoring current from the central office over the limb *L*, which current passes through all of the unlocking coils *C* shown in Figures 3 and 4, this causing the simultaneous unlocking of all the line relays and the restoration of the line to its normal condition, as shown in Figure 6. The unlocking windings on the line relays are of low resistance and differentially wound, one-half of each winding being placed in each limb of the line, so that each ex-

shown in Figure 8. The group of springs carried on this ringer is entirely independent of the movement of the armature during the ringing operation. With reversed currents, however, the armature is moved in the opposite direction from that necessary to ring the bells, and this causes the latching of the springs into their normal position. An extremely ingenious device is employed in order that the device shown in Figure 8 may perform this double function of ringer and relay. The secret of the whole matter is that the tapper rod of the bell is hinged on the armature so as to partake of the movements of the armature in one direction only. This has been called by the inventor and engineers of the Roberts system a "broken-back ringer," a name suggestive of the movable relation between the armature and the tapper rod, rather than of any decrepitude in physical make-up. As a matter of fact, the construction of the ringer is of the same substantial nature as that of the standard polarized ringer universally employed, the hinge action between the armature and tapper rod being of such substantial nature as to make the tapper partake positively of the movements of the armature in one direction, but to remain perfectly quiescent when the armature moves in the other direction.

The mechanism at the central office, by which selection of the proper station is made in a rapid manner,

is worthy of interest. It has already been stated that the selection of the proper subscriber is brought about by the sending of a pre-determined number of impulses from the central office, these impulses passing in one direction only and over the metallic circuit. After the proper party has been reached, the ringing current is put on in the reverse direction. This could readily be accomplished by hand, the operator merely pressing a selecting button or key a certain number of times and then throwing on the ringing current. The device actually employed, however, eliminates all necessity on the part of the operator to count the number of impulses. This device is shown in Figure 9.

The operator determines the proper number of impulses to be sent, by placing the pointer opposite the number on the dial corresponding to the station wanted. The ratchet wheel shown in the figure is stepped around automatically by each impulse of the current which is doing the selecting. When the required number of impulses have been sent, a projection carried on a group of springs shown drops into a notch on the drum of the selecter wheel, which instantly stops the selecting current impulses and at the same time throws on the ringing current. So rapidly does this device operate that it will readily throw the impulses of a Warner pole changer, even when this is adjusted to its maximum rate of vibration.

As a result of the use of this device, the operation of the system is made practically as rapid as that of an ordinary common battery party line without lock-out features. It is certainly more rapid than any bridging line where code ringing is used.

The selecter shown in Figure 9 is practically the only piece of apparatus required at the central office that requires special description. The listening and ringing keys are of standard design, the spring arrangements only being modified to perform the particular circuit changes desired. All such pieces of apparatus as drops, jacks and plugs are of standard design, and in fact those of any ordinary board may be used.

Either a drop or a lamp controlled by a relay may be used as a line signal, the signal being displayed automatically by the removal of the subscriber's receiver from its hook. In this respect, therefore, the system has all the advantages of common battery work for signaling.

The supervision may be either of the double lamp or single lamp type, as required, and the arrangement is such that the operator is not only notified when the subscribers are through talking, but also such that any subscriber desiring to use the line in an emergency may signal the operator without disturbing any conversation that may be going on.

The system of supervision is so complete that there is never a moment and never a condition or combination of conditions which in the slightest degree interferes with the exchange operator's knowledge of the conditions on the line; and furthermore the system of control is so complete that the operator is always able, in spite of what any subscriber may do, to give any party the use of the line, to put any number of parties on the line at once if desired, or to take away the line from any party and give it to another. So completely has the privacy of the line been provided for that it is absolutely impossible for any subscriber to hear the faintest sound in his receiver unless he has been given a talking connection by the operator. At all times, except when a party has been given a connection by the operator, his receiver circuit is absolutely disabled. Moreover, the mechanism at the sub-station is so inclosed and the circuits so arranged that it is impossible for a subscriber to resort to any trick by which he can artificially establish a bridge or temporary circuit which would throw the voice currents through his receiver and enable him to listen.

A brief description of the method of operation of the system may now be of interest. In order to secure a connection, a subscriber merely removes his receiver; and by so doing he transmits a signal to the central office in substantially the same manner as is now done in city practice. If the line is not already busy, the operator responds by inserting the plug of her cord as usual, and then pressing a signal key. Pressing this key connects the party who is called and rings his bell. Having taken his order, for example, for another party on another similar line, the operator inserts the plug of the other end of the cord in the proper jack, turns the dial

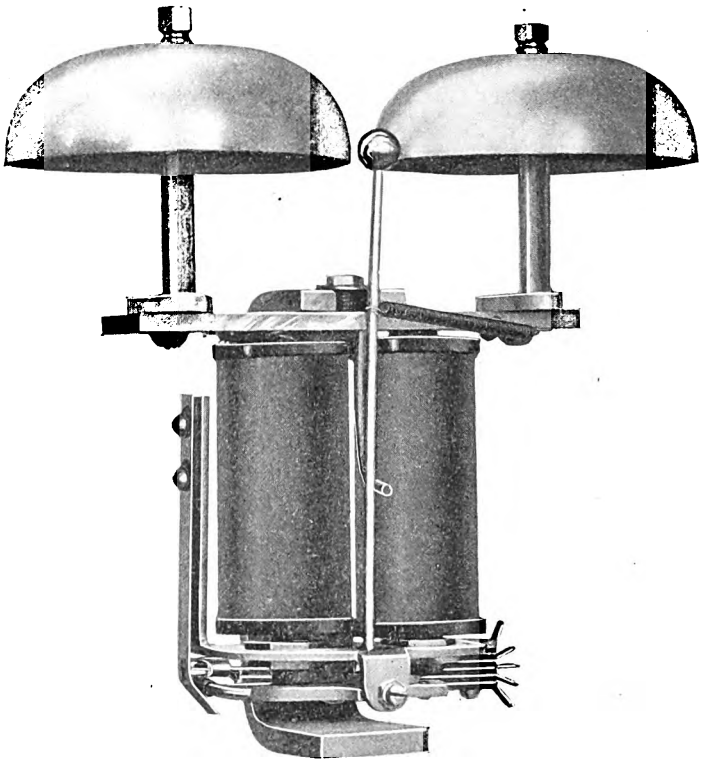

Figure 8.

pointer on the selecter to the number corresponding to the called-for party's number on that line, and presses the signal key. Pressing this key causes impulses to "run down the line," selecting the proper party and ringing his bell in the manner already described. The connection between the two parties has then been established, and no one else can in any possible way except by permission of the operator obtain access to the line. There is, of course, no necessity for code ringing.

Should the line be busy when a subscriber calls in, two courses of action are open to him. He may either hang up his receiver and call at a later time, or, a better way, and one which the subscriber soon learns, is for him to lay down his receiver without returning it to the switch-hook, and proceed with whatever business he may have in hand. This interferes in no respect with the action of the line. As soon as the line has been released by the other subscribers, the subscriber who failed to obtain a connection will be automatically notified by the ringing of his bell. If two, or any greater number of subscribers should thus attempt to obtain a connection while the line was in use and follow this practice of leaving their receivers off the hooks, they would be notified, one at a time, in proper turn, by the ringing of their bells, there being no confusion in their selec-

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tion, and no bad effects on the line by their receivers being left off the hook. This selection of subscribers who have made unsuccessful calls is accomplished without any special action on the part of the operator, the regular duties which she performs in clearing a line after a connection, serving automatically, in proper turn, to ring the bells of the subscribers who may be waiting.

The emergency call or signal already mentioned is an important feature. The circuits are so organized that at all times, whether the line is busy or not, the movement of the switch-hook up and down operates a signal before the operator. If the line is not busy, this signal is the drop or line lamp. If the line is busy, the signal is one associated with the cord circuit. In either event a simple movement of the switch-hook up and down, slowly and repeatedly, indicates to the operator that the subscriber has an emergency call. If the operator finds that the subscriber has misused this privilege of making the emergency call, she may restore the connection to the parties at the time engaged in conversation.

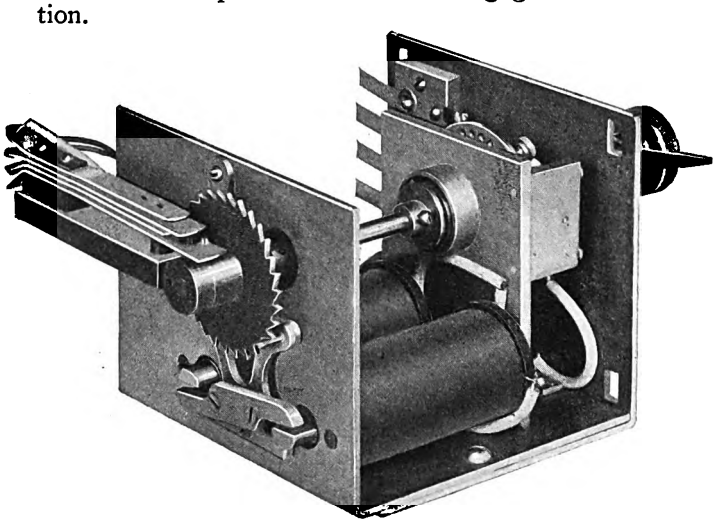

Figure 9.

The constant drain on the local batteries, that has already been referred to in connection with the ordinary system of party line working, is, without the addition of any parts or any complication of the circuits, taken care of completely in the Roberts system. At no time can the subscriber close the circuit of his local battery until the operator gives him a connection with the line. A subscriber who leaves his receiver off its hook in order that he may be signaled by the operator when the line is free, causes no deterioration of the local battery, because the battery circuit is held open by the switch contacts carried on the ringer. This important feature will be appreciated by those managers of telephone exchanges who have suffered both expense and annoyance by the constant drain on their batteries.

The economy of current is not confined alone to that of talking current in the Roberts system. Although less noticeable and less important, there is also a considerable saving in the matter of ringing current, whether this be furnished by generators or by pole changers. Since it is only necessary in the Roberts system to ring one bell at a time, it is obvious that the current employed may be of considerably less strength than in those systems where it is necessary to operate a large number of devices in multiple.

Frequently in exchanges employing party lines, much annoyance is caused by the inability of the operator to identify the station on a line from which a call is made. Sometimes when a message rate is charged, the party calling will, with fraudulent intent, deliberately give the name or number of another party on that line. In other cases a subscriber may use abusive language or resort to other undesirable practices, the operator being unable to determine definitely at which station this occurs. In the Roberts system this identification of the station is always readily made by the operator, as will be understood from the description which has preceded.

An inspection of the circuits given in this article will make it evident that the problem of the trouble shooter is greatly simplified in the Roberts system, whether this trouble be on the line or in the sub-station apparatus. In order to locate almost any trouble, the operator has only to select each station successively and she will be at once notified as to the section of the line in which the trouble exists. It is evident that the location of the trouble on the line is thus greatly facilitated, and the simple construction of the instruments and the fact that they are all alike contribute to the facility with which repairs can be made after the trouble is found.

There are many cases in sparsely settled communities where the distance between exchanges is so great, and the number of subscribers along the line connecting the exchanges so few, that there is not enough traffic to warrant the establishment of a through toll line and of another line for picking up the local traffic. As a result, in these communities, the ordinary practice has been to bridge the local subscribers on to the through line, thus greatly injuring the qualities of the line for toll work and making it possible for any of the local subscribers to listen in on the toll conversations, with all of the annoying results that have been pointed out.

Frequently when the number of subscribers is too great to be permanently connected to the through line, local switching stations are established at which stations operators must manually connect the subscribers as desired. The expense of this practice is a serious burden to the exchange management, and the fact that such small switching stations are usually attended by indifferent operators makes the whole arrangement an undesirable one.

The adaptability of the Roberts system to such problems as this will be apparent with a little consideration. If we assume a line extending from one exchange to another, with a number of way-stations equipped in accordance with the Roberts system, it is obvious that the operator at one of the exchanges may at will cut the line straight through to the other exchange in order to get a through connection. When such connection is established the advantages of a through metallic circuit between exchanges are secured. None of the local or way-station subscribers may in any way interfere with the operation of the line, nor have they the power to bridge across the line any of their apparatus. When the line is not being used for a through connection, any of the subscribers may be connected at will to any other subscriber on the line, or to any subscriber in either of the exchanges. During such use of the line by local subscribers, the operator could cut off the local subscribers at any time in order to establish a through connection.

1,430-Mile Telephone Talk.

The longest distance the human voice has been transmitted is believed to be from Montreal to Winnipeg, 1,430 miles, over a special copper wire along the line of the Canadian Pacific railroad. This wire, which has intermediate connections only at North Bay and Fort William, was installed by the railroad company for its telegraphone system, by means of which two messages, one by telephone and the other by telegraph, can be transmitted simultaneously over the wire.

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Some Questions Answered

By Arthur Bessey Smith

Instructor of Telephone Engineering, Purdue University.

IN the query column last month mention was made of using a repeating coil in a common battery line to isolate that one line from all others and from the ground on account of bad induction from a power line. In the circuit proposed, use was made of a relay in series with the line, whose contact operated the supervisory signal by short-circuiting a condenser placed in the switchboard side of the repeating coil. In testing the operation of the circuit in the telephone laboratory of Purdue University, a further fact was noticed in connection with

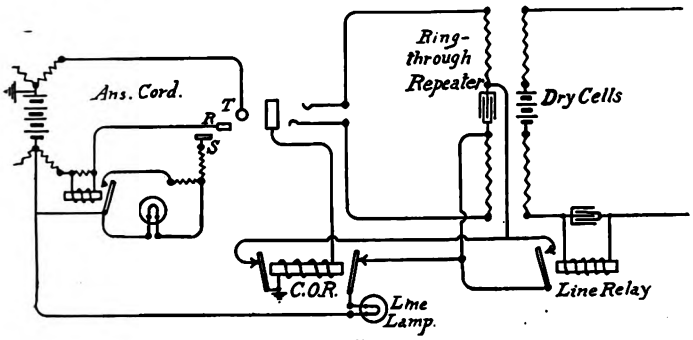

Figure 1.

supervision, which will be of interest to our readers.

For the sake of clearness, the cut of this circuit is here reproduced as Figure 1. As its operation was described in the May issue, I will not repeat it. In putting the scheme into operation, several kinds of relays were tried in the line, to see which would be the best for the purpose, since the same relay has to act as both line and supervisory. As long as spring relays were used, no difficulty was found in making the circuit a perfect success; but when a gravity relay was introduced, it stuck on the first operation. This was fatal to supervision, which requires that the relay shall be under the control of the subscriber. This freezing occurred the same if the armature was pushed up by hand or if done by the current in the coil. Quite a good-sized spark was also observed at the relay points just as the contact was being made.

The action is probably something like this: In its normal condition, the condenser is charged to the full

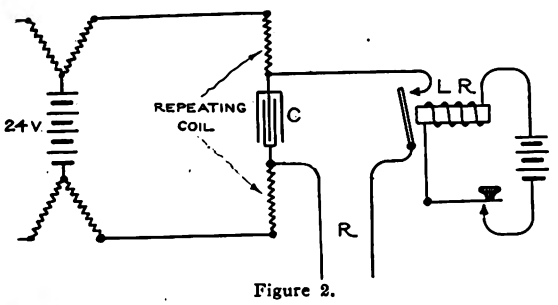

Figure 2.

potential of the battery. When the relay pulls up, it places a dead short-circuit across the terminals of the condenser, so that all the electricity stored in it rushes out suddenly, there being quite a large current for a short time, due to the low resistance of the path. By inserting a 100-ohm relay in one of the wires leading from the condenser, the fault was entirely cured.

The question now arose, what was it in the 100-ohm relay that did the work? It possessed both resistance and inductance. Which was the thing that did it? To answer the question, the circuit was rearranged as in Figure 2, which is merely the essentials of Figure 1 in the supervisory condition. *L-R* is the line relay, whose contacts were sticking, and which was operated by the key in a separate circuit. At *R* the extra resistances were introduced to cure the freezing. The condenser *C* was four microfarads.

The first test was to see if non-inductive resistance would prevent freezing as well as the relay. Accordingly a resistance box was connected at *R* with about 100 ohms unplugged. This gave no sticking whatever. Upon reducing the resistance of this box, it was found that 17 ohms was the least that would work. If made even one ohm less, the relay *L-R* would sometimes stick. The capacity of the condenser was then made two microfarads, to see if that had any effect on the sparking. This increased the necessary resistance to 22 ohms. That is, the spark tending to make *L-R* freeze was worse with two than with four microfarads. It also showed that an inductive resistance was not necessary to prevent sticking.

Having eliminated the inductive part and found that resistance alone would cure the evil, it was desired to see what the effect would be of inductance alone. Now, it is impossible to get an inductive coil without wire, and wire means at least some resistance, although if care is taken to use very large wire and many turns on a good iron circuit, the ohmic resistance may be kept so low as to have almost negligible value. We had in the laboratory a

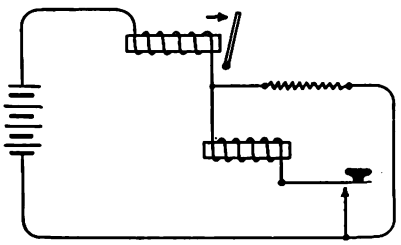

Figure 3.

relay of 1.4 oms resistance, but of considerable magnetizing power. This was placed in the circuit at *R* in place of the non-inductive resistance. It was found that this was as effective in preventing sticking as was the non-inductive resistance. Its ohmic resistance alone was away below that required by the above tests, so it was not that which did the work. It could only be attributed to the inductance. Putting it all together, the conclusion is that the 100-ohm relay, which was tried in the first place, operated both by its resistance and by its inductance. But it also settles the question of cost, as the non-inductive German silver resistance is much cheaper than a retardation coil would be.

Among the various relays tried at *L-R*, quite a difference was found in the tendency to sticking. All spring restored relays did not stick at all. All gravity restored relays, with the exception of one make, would stick, but with varying degrees of intensity. The tendency to stick may be measured by the non-inductive resistance required at *R* to prevent sticking. The thought occurred that perhaps the back-down resistance of each relay might have something to do with its tendency to stick. To test this point, a back-down circuit was arranged as shown in Figure 3. *A* is the relay to be tested. *R* is the resistance box which is to limit the current and reassure the back-

down resistance. Relay *B* and the key are to pull the relay *A* up preparatory to releasing it to see if the current through *R* can hold it up. The results on two relays will suffice to show how the wind blows, all the tests being in harmony with the two given.

Freezing resistance: Relay No. 1, 13 ohms; relay No. 2, 23 ohms.

Back-down resistance: Relay No. 1, 2,300 ohms; relay No. 2, 26,600 ohms.

This relation is a very reasonable one, for the ability of a relay to free itself from a stuck point depends upon the strength of its restoring force. This depends on the strength of the restoring spring, in the case of spring relays, or on the relation of center of gravity of the armature to the pivot point, in the gravity relay. In the latter, the weight of armature and the length of air-gap plays greater part than in the spring relay. But the back-down resistance also depends on the restoring force, so the two have a very close relation.

At first thought, a person would think that if the spark from a four microfarad condenser had a certain intensity, and made a certain degree of freezing in the relay points, a condenser of half the capacity would have half the spark and half the tendency, or at least that it would be noticeably less. But the reverse was found to be the case. The same relay which had a sticking resistance of 17 ohms with four microfarads required 22 ohms on two. This was uniformly the case. Thinking that the inductance of the repeating coil had something to do with it, I measured its resistance and replaced the coil with its equal non-inductive. Trying the sticking resistance again with both condensers, the resistance was lowered to about 6 ohms, and was the same for both. There may have been a difference, but it was so small as not to be noticeable. It seems that the intensity of freezing in this case at least depends more on the inductance than on the capacity in the circuit.

These are interesting points, which might well be followed to conclusion by some one. Their complete results may explain some puzzling cases of relay sticking, which sometimes occur.

It is always a pleasure to know that the readers of a paper are taking interest in the matter published. If there were never a question raised as to the correctness of its statements, we might think that it was never read, or at least not seriously. Therefore it is with the greatest pleasure that we publish a letter which we have received, calling attention to an error in the May issue. It concerns the ability of a telegraph operator to read a telegraph message which has passed by induction to a telephone line.

Editor Sound Waves: I have been interested in your issue for May, and especially in "Some Questions Answered." I beg to say, however, that you are decidedly wrong in your answer to the correspondent who asks regarding the ability of a telegraph operator to read a message on a telephone that has been induced from a telegraph circuit where the lines run parallel for some distance. The matter is possible. I have done the trick hundreds of times. In our local exchange we have grounded lines and I frequently hear the telegraph messages and can read them plainly.

In reply we have only to say that our answer was based on the statement made by an experienced operator to the effect that it could not be done. As the correspondent says that he has done it, no more is to be said, except that it must be that our experienced operator was wrong. We are always glad to open our columns at any time to any subscriber who holds different opinions. I wish to extend the invitation to all who read this paper to write freely concerning all telephone matters, whether they may seem old to you or not. You may send in something which is a little old to you, but may be new and valuable to some one else.

Editor Sound Waves: A telegraph operator told me that he was alone in his office, all lines were quiet, and he heard and was able to distinguish a telephone conversation between two persons. The talk apparently came from one of four sets of instruments which were upon his table, but before he could make an investigation, one of the lines began working and he was blocked. This is only hearsay evidence, but interesting if there is any manner in which to arrive at some experiment to verify it. The armature of either the sounder or relay must have taken the place of the receiver diaphragm, and possibly the adjustment necessary to get the effect was one that could not be made again.

The phenomenon to which the correspondent refers is one of the very interesting things which infrequently occurs. I have heard of other cases where operators have heard voices from telegraph apparatus and have every reason to believe it. I once heard a telephone inspector tell of hearing a common telephone bell that would talk. Last summer I had a very similar experience. I had attached to a small alarm clock a shaft carrying a brass wheel with a contact spring, which was designed to make and break the circuit at stated intervals in a battery test. In order to keep track of the opening and closing of the

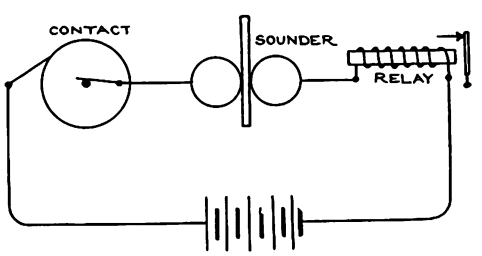

Figure 1.

circuit, I put a telegraph sounder in series with the contact and relays, as in Figure 1. One day I noticed a peculiar scratching sound and traced it to the sounder. The contact wheel on the clock was somewhat rough, and the uncertainty of contact made undulations in the current, which were repeated by the sounder. The adjustment was very close, and I found that I could duplicate it easily. Since then I succeeded in reproducing speech with a relay. Figure 2 shows the connections. By a little experiment I was able to hear quite distinctly what a person was saying on the telephone line to which the apparatus was attached. The air-gap was the chief ad-

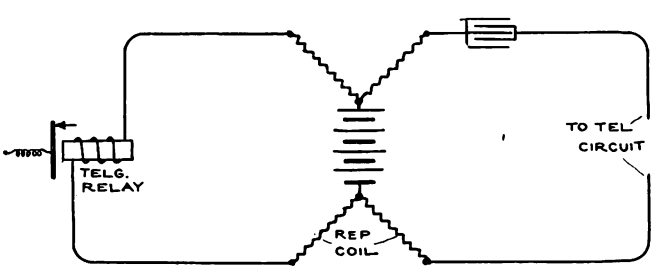

Figure 2.

justment, as it did not seem to make much difference about the tension on the spring. The relay used was a common pony telegraph relay, wound to twenty ohms resistance. Undoubtedly it is the iron armature of the relay which plays the part of diaphragm, as suggested by the correspondent. This is proven by the cessation of sound when the armature is touched.

Editor Sound Waves: We have a direct current fan in our office and the lighting current is alternating. Is it possible for us to run this fan off this current, and in what way should it be connected?

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While it may be possible in some cases to make a direct current motor run on alternating current, it is highly inadvisable to try it. Direct current motors are made with solid iron field magnets, and the alternating current sets up such eddy currents in the iron that the motor heats unduly. You had better sell the motor and buy one designed for alternating current.

Editor SOUND WAVES: We have about thirty-three lines on our exchange. Part of them are metallic and part are ground return circuits. There is considerable cross-talk on some of the lines. The lines on which it is the worst, run for quite a distance parallel to each other. They are rural lines and are too long to justify making metallic circuits of them. They are grounded on separate ground rods at the exchange, but are not very far apart. Would it lessen the cross-talk any to ground them all on one rod at the exchange? Where a ground circuit runs parallel to a metallic circuit, the cross-talk is about as strong as it is on two parallel ground circuits.

In the case of the parallel ground return lines, the cross-talk is evidently not caused by any leakage of current from one line to the other. This being the case, the question of whether the lines are grounded at central on the same ground rod or not will not affect the loudness of the cross-talk. These lines would cross-talk as loudly as ever if they were not grounded at central at all. It is a good plan to make one extra good ground at the office and ground all your lines, lightning arresters, etc., on it. If your metallic circuit lines are badly troubled with cross-talk, they must be poorly transposed, if at all. Or perhaps they may have leaks on them. No matter if a line is trimmed up this year, so that it is entirely clear of grounds, it takes eternal vigilance to keep it so. I would advise looking carefully after the insulation of the metallic circuit lines, and if clear, then go after transpositions. Notice under what conditions the metallics give you cross-talk. If a metallic is connected to a grounded line with a straight cord, that is, a cord which has no repeating coil in it, it makes it also a grounded line and the cross-talk on the whole combination will be bad. Metallic circuits are for the purpose of obtaining quiet lines, and if they are not quiet they should be made so.

Editor SOUND WAVES: I have heard cable testers speak of the universal shunt for galvanometers. They say it will fit any galvanometer of any resistance. I would like to know what it is, and how it operates. Is it really universal, or is its accuracy only an approximation?

The Ayrton universal shunt is a very valuable device for getting rid of the troubles incident to the use of the ordinary plain shunt on galvanometers for all kinds of

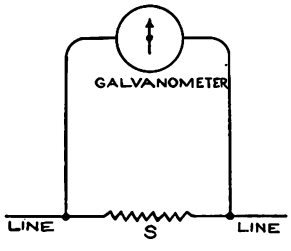

Figure 3.

testing. It is really an accurate shunt and will give exact results if used as designed. The ordinary shunt is shown in Figure 3. If S be the resistance of the shunt and G that of the galvanometer, the multiplying power of the shunt will be

$$\frac{G+S}{S}$$

That is, if we are using the galvanometer for measuring the current that is leaking through the insulation of a line, we would read the deflection of the needle, which, from our previous calibration, gives us the current through the galvanometer. But what is the current in the line? It will be greater, due to the shunt, which allows a portion of it to pass around. If we multiply the current through the galvanometer by the multiplying power of the shunt, it will give us the current in the main line. Thus,

$$I_o = I_g \frac{G+S}{S},$$

where I^o=total current in the line and I^g=current in the galvanometer. If the galvanometer resistance changes, the value of the multiplying power will change.

Figure 4 gives the circuit of the universal shunt. The resistance r is commonly made 10,000 ohms. This will make 1-10 r=1,000 ohms, and the other points in proportion. If we place the slider on the contact marked l, and pass a current through the combination, we will get a certain deflection. If we now place the slider on the 1-10 contact, the same current as before will give us exactly one-tenth as large a deflection. If placed on the

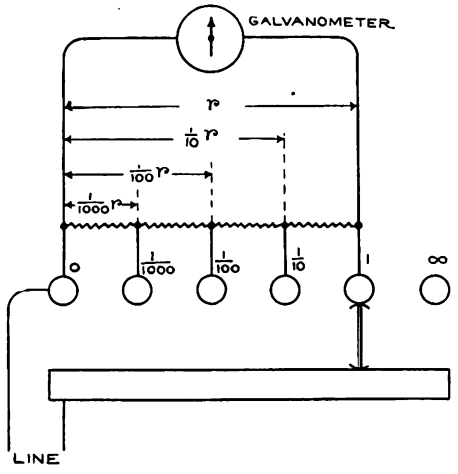

Figure 4.

1-100 point, the same current will give us a deflection only one-hundredth as large as when on the l contact. The reason is this: when the slider was on the contact marked l, the galvanometer got nearly all of the current, since the resistance shunted around it (r=10,000 ohms), is so large compared with that of the galvanometer, which is usually from 50 to 1,000 ohms for ordinary work. But, to be exact, apply the formula for current, knowing the deflection and current in the instrument. The line current will then be

$$I_o = I_g \frac{G+S}{S} = I_g \frac{G+10{,}000}{1{,}000}$$

If the galvanometer is 100 ohms, it will make $I^o = 1.01 \times I^g$, which is its exact value. If the slider be placed on the 1-10 point, the line current will be

$$I_o = I_g \frac{100+10{,}000}{10{,}000} = 10.1 \times 1_g,$$

which is ten times the value we got for the l point. The secret of its action is in the fact that the numerator of the multiplying power is kept constant.

Editor SOUND WAVES: I am enclosing you a diagram of two of our country lines on which we want to put a phantom circuit. Our 101 line is getting too many subscribers on it and we want to cut it in two at the cross-roads and put the east end on a line by themselves. But we are so crowded for space on our poles that we think it would pay to bring in the east end on a phantom over the other two lines. All the telephones on both lines are semi-selective, having their bells bridged from

one side of the line to ground. Half of the bells are on one side and the rest on the other side. What we want to know is, can it be done? We will appreciate a reply in the next issue of SOUND WAVES.

The diagram which our reader inclosed is reproduced in Figure 5. I can appreciate the correspondent's feelings about the overloaded line and his desire to remedy the condition. The plan of cutting off the east end of

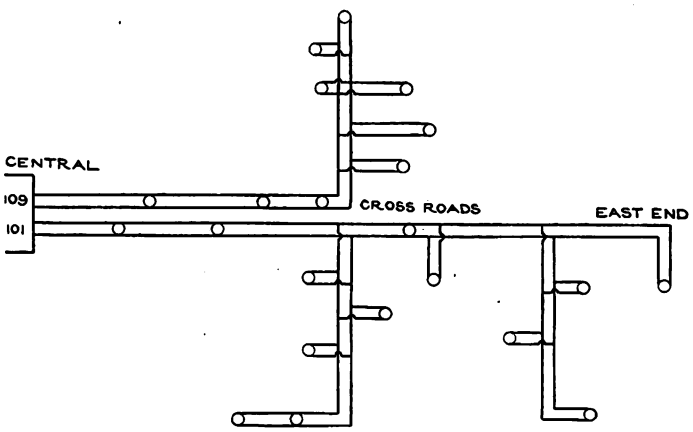

Figure 5.

line No. 101 and bringing it in as a new line is excellent. This leaves seven subscribers on the old line and six on the new. If all the bells on both lines were bridged across the line and the lines are well insulated, you might get a successful phantom. But the fact that the bells all go to ground kills the project.

A close study of Figure 6 will make this point clear. If the bells on the east end are to be rung from line to ground on the phantom, it will ring at the same time all the bells on either 101 or 109. If the bells on the east end are to be rung metallic, there will be a disturbance in all the bells on both lines. The figure is drawn to

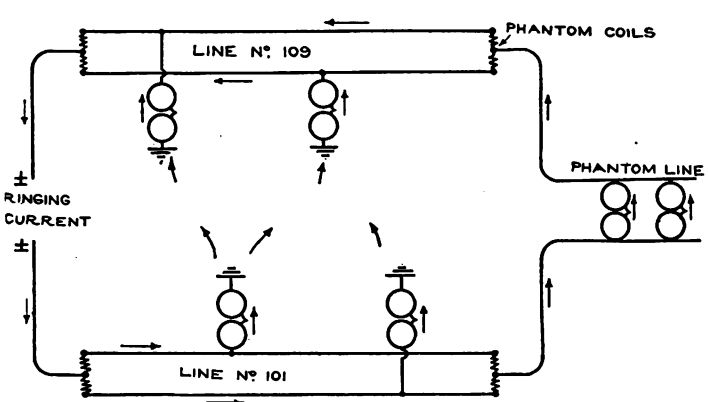

Figure 6.

show the flow of ringing current at any given instant, while ringing the phantom line metallic. It will be seen that current will leak to ground through all the bells on line No. 101, go through the earth to the bells of line No. 109, returning by that line. Of course, current will go through the east end bells also.

If the territory in the vicinity of those east end subscribers is about filled up, you would better get the new line into central by brackets or under-hang brackets, or the phantom will not work.

Editor SOUND WAVES: The article about "Common Battery Troubles" in the May number of your paper has interested me very much, but I do not understand one point. It spoke of a polarized bell being in series with a condenser. Now, I thought a polarized bell would not ring selectively through a condenser. I have tried it, and it rings more or less no matter whether it gets positive or negative current. And if the spring is slacked back entirely it rings better than ever. I do not see how you could make it select.

This is merely a mistake in terms on the part of the correspondent, one which is often made, however. A polarized bell is one in which the armature has a permanent magnetic set, so that the direction of its motion depends on the direction of the current. It requires an alternating current to ring it. A *biased* bell, to which the correspondent is evidently referring, is a polarized bell in which the armature is held to one side by a light spring It will ring with alternating current, or with a pulsating current if it pulsates in the right direction. The pulsation carries the clapper over, and the spring brings it back. I am glad that the point has been brought up, for many people get the terms "polarized" and "biased" somewhat confused.

Editor SOUND WAVES: What is meant by the expression, "backing a relay down"? Please answer through your paper.

It requires more current to pull a relay armature up into position that it does to hold it there. The reason is that when the armature is back, the air space between the pole of the magnet and the iron armature is much longer than when pulled up. It is harder to set up sufficient magnetism in air than in iron, so the current in the coil must be strong. But when once pulled up, a very small current will maintain enough magnetism to hold it there. If we increase the resistance in series with the relay and so decrease the current till the armature releases, we say that we have "backed it down." The back-down resistance is usually stated as the resistance that must be inserted to back it down if the voltage and other conditions are normal.

Editor SOUND WAVES: On combination poles which carry both electric light and telephone wires, which should go above? Some of the wires are low tension, from 110 to 220 volts, while the rest are 2,200 volts.

In the case of the high tension wires, there is no question about the desirability of placing the telephone wires below. Being smaller and more likely to break, they would get into serious trouble by falling onto hot wires like those which you mention. Even if you are using cable, which is not as likely to break as the electric light wires, the fact that the telephone people have to do more work on their circuits than the power company should make you place the telephone lines below. If the low tension electric light wires run for only a few spans and all alone, without primaries, there is not as much need for forcing them to go above. But even in this case it would be better.

Editor SOUND WAVES: We have been having trouble with the dry cells furnished by the company that makes our telephones. Our contract specifies that they shall furnish with each instrument two good dry cells. When we put the telephones out on the line in service, the battery seldom lasts more than three or four months. We think it should last longer. Occasionally it will last six months, but not very often. We are renewing them as fast as they wear out, replacing them with another make. These last nine or ten months, it seems to be that the battery that we are getting with the telephones is not good. How can we test and prove it?

The trouble to which the correspondent refers is one which I have found to be common on magneto exchanges. It is not as likely to be poor battery as it is the incessant use to which farmers put a telephone when they first get it. It is a new thing and they are justly pleased in its possession. Many of them do not realize that when they are "just rubbering" it uses up battery as fast as when they are talking. So the battery gets hard service

and runs down in a short time. By the end of a few months the telephone gets to be an old thing, and gets only the use for which it was intended. This is usually why the second set of battery lasts longer than the first. Try this experiment the next time you put in a new line. Take all the battery that comes with the telephones, put it in service in telephones that have been in use long enough for the novelty to be worn off. Put new cells of the make that you buy in the new telephones and install them on your new line. The chances are that the cells of your choice will go to the bad in the new telephones about as quickly as did those furnished by the manufacturer. At any rate, you will get some interesting information out of the experiment.

Editor SOUND WAVES: How can I test a pair of repeating coils to tell if they are balanced good enough to use for making a simplex telegraph circuit? We wish to put a telegraph line on one of our toll lines, and have some coils which we think we can use for the purpose, but are not sure.

The test is very easily and simply made, requiring only a telephone receiver and some battery. Connect the two coils to be tested as shown in Figure 7. Care must be taken to connect the "finish" end of one winding to the "start" end of the other winding of the same coil. Hold the receiver to your ear while you make and break the battery circuit with the wire *W*. This imitates the

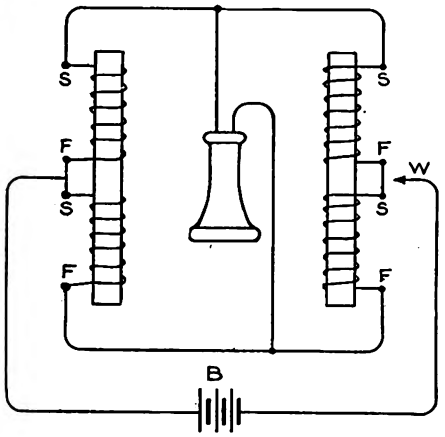

Figure 7.

condition of actual use with the telegraph, except that there is no line to speak of between the two coils. You should get no click in the receiver, or, at least, it should be so faint as not to be noticeable to the ordinary user. If the line on which you desire to use these coils is unbalanced by leaks, you will get telegraph noise even if the coils are perfect.

Editor SOUND WAVES: We have been using a voltmeter to test for grounds on our exchange. The instrument has two scales, 3 volts and 150 volts. It is a Weston portable standard. I have noticed that when I get a very high resistance ground it will not give me any better reading on the 3-volt than it will on the 150-volt scale. Why is this? I usually use the high scale, since my battery is 24 volts, and on ordinary grounds I can not use the low scale at all, as it is too sensitive. I will appreciate an answer through SOUND WAVES.

When you put a voltmeter with battery in series with another resistance, the deflection will be proportional to the current. The magnitude of this current depends on the voltage and the total resistance. This total resistance is made up of two parts, that of the voltmeter itself and that of the external circuit. If the external resistance is small, as in the case of a dead ground, you will get very nearly a full voltage reading, because the resistance of the voltmeter is the controlling factor. If the external resistance is very large, perhaps ten or twenty times as much as the voltmeter, it will control the current. When you change from the high scale to the low, you change the voltmeter resistance from about 15,000 ohms to 300 ohms. If the external resistance is a million ohms, the small matter of 14,700 ohms will not change the *total* resistance enough to make any difference in the reading. It is the total resistance that counts.

Editor SOUND WAVES: We have an American universal grounded circuit switchboard. We desire to connect a metallic circuit of No. 10 iron wire to this board. Can there be a repeating coil placed in the cord circuit, or will it have to be paced in the line circuit; and use a ring-through coil? Of what resistance should be the ring-through or the talk-through coil? Please answer in your valuable paper.

From your description of the switchboard, I take it that the cords are metallic circuit as well as the line circuits, and that one side of all the lines are tied to earth, leaving the other terminals to go to the lines. If this is the case, you have your choice. If you put the repeating coil in the cord circuit, it can be of the talk-through type, which is commonly wound in four windings. The resistance of each winding may average from 70 to 90 ohms. In use, two of the windings are connected in series and put to the answering end of the cord, and the other two windings similarly connected together and put on the other end of the cord. This makes the resistance of one end of the coil about 140 to 180 ohms. Putting the coil in the cord will necessitate care on the part of the operators to use a particular cord on that particular line. Also the use of a talk-through coil in the cord introduces some difficulties in ringing off, which it is impossible to answer without knowing the details of the board, such as whether there are bridging clearing out drops on the cords, or bridging line drops used as clearing out signals, or if they are series and used for the same purpose.

If you are to have only one metallic line, the better plan is to put a ring-through coil on the line circuit. I have used one thus on lines having as many as ten subscribers, and the people could not tell the difference. Ring-through coils are also wound in four windings, with an average of about 150 ohms per winding. With two windings in series the same as the other coil it makes one side about 300 ohms. These figures vary with different manufacturers.

Independents at Wheeling.

The second annual convention of the West Virginia Independent Telephone Association convened at Wheeling May 10, with a large attendance of telephone men from West Virginia, eastern Ohio and western Pennsylvania. The business meeting was held on the afternoon of the first day, at which the key of the city was formally handed to the delegates by Mayor C. C. Schmidt, and suitable responses were made.

The first session adjourned at 5, when the members took special cars to Wheeling Park. There a hundred and fifty were served with supper and the evening was devoted to vaudeville and the pleasures of the park.

The program for the second day was closely adhered to and is submitted as follows:

"Standard Construction," Frank B. Hall, Rochester, Pa.
"Value of Good Toll Lines," Frank Hart, Pittsburg, Pa.
"Pooling of Toll Lines," W. C. Handlan, Wheeling.
"The Folly of the Sub-licensee;" J. Walter Barnes, Fairmont.
"Our Employes," Lon H. Hutchison, Huntington.
Recess.
Reports of committees.
"The Right of Territory," J. W. Downs, Buckhannon.

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"Independent Telephone Securities," A. C. Davis, Parkersburg.
"Rural Telephones," T. B. Lee.

The new officers of the association are: President, A. C. Davis; first vice-president, J. H. Wise; second vice-president, W. M. Line; vice-president third district, J. W. Davis; vice-president fourth district, Hugh Amos; vice-president fifth district, Lon H. Hutchinson; secretary, W. C. Handlan; treasurer, Lloyd Beeghly; member advisory board, J. Walter Barnes. The executive committee is composed of W. C. Handlan, J. Walter Barnes, Lon M. Hutchinson, E. K. Hertford and A. C. Davis.

The subject of telephone construction was taken up on the assembling of the convention. The talk was by Frank B. Hall of Rochester, Pa., and was most able. Frank Hart of Pittsburg discussed the subject of "The Value of Good Toll Lines," and following his talk a general discussion arose. Mr. Handlan spoke on the matter of pooling toll lines for the furtherance of long distance service among the Independent companies, and it was one of the interesting talks of the session. J. Walter Barnes and Lon H. Hutchison each read papers and concluded the business of the morning.

When the convention assembled in the afternoon the routine of business was at once taken up. The commitee on nominations reported, and the new officers were elected.

The resolution committee reported upon several matters and conveyed especial thanks to those who had assisted in the success of the convention, while the committee on legislation also made an interesting report.

James B. Hoge, of Cleveland, president of the International Independent Telephone Association, made a very interesting address upon the telephone situation in the country at large, while T. B. Lee of Waynesburg discussed the subject of rural telephones. A. C. Davis of Parkersburg spoke, and the last address was made by J. W. Down of Buckhannon on the subject, "The Right of Territory."

The convention, on the whole, was voted as one of the most successful ever held by the organization.

The Deadly Electric Wire.

The danger incurred in touching an electric circuit does not depend wholly on the voltage or electric tension. Two-thousand-volt circuits have been touched with impunity, and contact with incandescent light circuits of only one hundred and twenty volts has caused instant death.

The physiological effects of electricity are due partly to electrolysis or decomposition of the blood and other fluids and partly to paralysis of vital organs. Both actions are proportional to the strength of the current that actually passes through the body, and this current strength is equal to the voltage of the circuit touched divided by the electric resistance of the body. The average resistance measured between a hand and the feet, when the hand is moist and the shoes are soaked with water, is about 5,000 ohms. A current of one-twentieth of an ampere—one-tenth of the current used in an incandescent lamp—may cause death. Hence, the question is, Under what conditions will contact with an electric wire send such a current through the body?

If the right hand touches one wire and the left hand simultaneously touches the other wire of a 110-volt incandescent lighting circuit, the body, assuming its resistance to be 5,000 ohms, will be traversed by a current of 110/5,000 ampere, or little more than one-fiftieth of an ampere, which is within the limit of safety. But if the hands are dry the resistance measured from hand to hand is fullly 10,000 ohms, so that both wires of even a 220-volt circuit, such as is used in some incandescent lighting systems, can be touched without danger of serious injury. In certain factories, however, where the air is damp, warm, and laden with acid vapors, the skin becomes softened and the resistance so greatly diminished that it is not safe to touch both wires of even a 100-volt circuit.

The writer's left hand once came so near the terminals of a 1,000-volt transformer that it drew luminous electric arcs from them. The current, having so small a resistance—less than two inches of the hand—to overcome, was very strong, but it caused no injury except local burns, because it did not traverse a vital part.

In instructive contrast to this case is the experience of the inventor of an electric bath tub containing metal plates that could be connected with a 220-volt lighting circuit. The inventor tested the device on himself and was instantly killed, because soaking in water had so reduced the resistance of his body that even this low voltage produced a deadly current.

If a man, standing on a trolley rail or even on the ground, touches a broken trolley wire carrying the usual pressure of about 500 volts, a current of one-tenth of an ampere will pass through his body, if its resistance is 5,000 ohms, and will probably cause death. In this case the ground or the rail represents the second or return wire. It is much less dangerous to touch a single wire of a double-wire circuit, well insulated from the ground, for in order to reach the other wire the current that traverses the body must flow through or over some of the insulators, that is to say, through a very great resistance, so that the current is very weak. But in a very long line the sum of these little leakage currents through many insulators may be too great for a human body to carry with safety. Hence, the danger is proportional to the length of the line. Simultaneous contact with *both* wires of a high-voltage circuit is, of course, fatal.

The static electric charge of the wire, as distinguished from the flowing current, is another source of danger, at least in alternating circuits. In continuous-current circuits this charge acts only once, at the first instance of contact, but in alternating-current circuits the charge is changed from positive to negative and back to positive usually about one hundred times a second, and when a man touches the wire the electricity which forms these charges surges back and forth through his body. Most of the casualties produced by touching alternating circuits are due to this cause. The danger is proportional to the electric "capacity," and therefore to the length of the wire. Burying the wires increases their capacity and makes them still more dangerous to handle, but it effectually keeps the average citizen away from them.

The danger is proportional to the frequency of alternation, if the frequency is not very great, but currents of several hundred thousand alternations per second, such as Tesla employed in his amazing experiments, do not penetrate deeply, so that when they traverse the human body their effects are confined to the skin and are not serious. The facts that high voltages and high frequencies have been commonly associated in experiments and that extremely high frequencies have been shown to be harmless, have led to the widespread belief that exceedingly high *voltages* are quite free from danger. This is entirely erroneous, as the curious reader may easily prove to his own satisfaction—or, at least, that of his heirs.—Condensed from Herman Zipp in *Die Umschau.*

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Recent Telephone Patents

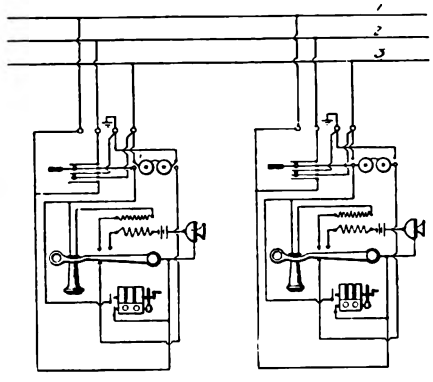
By David S. Hulfish

848,749. Trunk.—Joseph B. Kelley and Edwin B. Heaford, Omaha, Neb. Filed December, 1906. A system of circuits for automatic signaling over toll lines connected with a common battery switchboard.

848,793. Relay.—H. G. Webster, assignor to Milo G. Kellogg, Chicago, Ill. Filed February, 1907. A relay having an armature adapted to occupy three positions, with provision for holding the armature in its first, second or third position.

848,814. Trunk.—W. W. Dean, assignor to Kellogg S. & S. Co. Filed July, 1902. A double-track trunk adapted to work between two common battery multiple switchboards of the Kellogg type.

849,032. Telephone System.—Charles A. Wardner, Brushton, N. Y. Filed December, 1905. (See cut.) The subscriber's sets upon a party line are each given a special switch by which

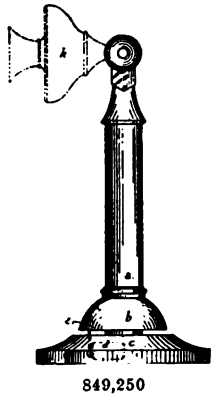


849,032

the subscriber may call the central office over a special circuit when the main metallic talking circuit of the party line is busy.

849,100. Guy-Wire Fastener.—Aaron Bearse, Syracuse, N. Y. Filed August, 1906. An improved guy clamp for attaching a guy securely to an anchor rod.

849,250. Combined Desk Stand and Call Bell.—Charles A. L'Hommedieu, Buffalo, N. Y. (See cut.) Filed January, 1905.



849,250

The gong of the bell forms an ornamental portion of the desk stand and the operating magnets are within the base of the desk stand.

849,336. Signaling System.—F. R. McBerty, assignor to Western Electric Company. Filed July, 1902. The line and supervisory signals have each two magnets; the first magnet displays the signal and the second magnet effaces the signal while both magnets are energized.

849,353. Electric Earphone.—Lewis F. Clarke, assignor to Globe Earphone Company, Boston, Mass. Filed February, 1907. A dry cell is so attached to a portable telephone as to form a handle therefor.

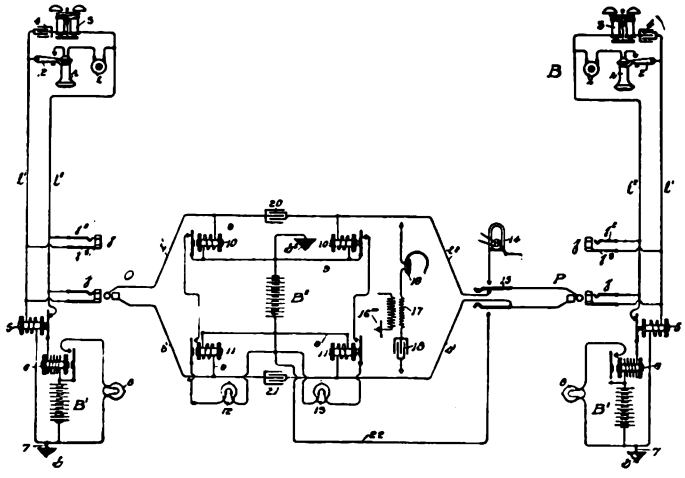
849,375. Telephone System.—W. W. Dean, assignor to Kellogg S. & S. Co. Filed May, 1901. (See cut.) A simple two-way multiple system.

849,443. Relay.—Harry G. Webster, assignor to Milo G. Kellogg, Chicago, Ill. Filed January, 1905. A modification of an early type of return-pole-piece relay.

849,464. Trunk.—W. W. Dean, assignor to Kellogg S. & S. Co. Filed July, 1902. A trunk working into a divided multiple switchboard. The usual signaling conditions are provided for.

849,615. Switch Box.—Stephen C. Houghton, Rome, N. Y. Filed January, 1907. (See cut.) A box mounting for outdoor line jack, the plug being carried on a portable telephone set.

849,745. Attachment.—Flora G. Moulton, Chicago, Ill. Filed October, 1906. An attachment permitting the adjustment of the transmitter in horizontal and vertical circles.



849,375

849,850. Telephone System.—Leopold F. Mueller, Passaic, N. J. Filed August, 1905. A house system. The batteries are common to all of the stations, and any station may call any other station automatically.

849,896. Insulator.—Charles Griffith, Elizabeth, Pa. Filed March, 1906. (See cut.) This porcelain knob has a cam clamp to secure the wire quickly and without a tie wire.

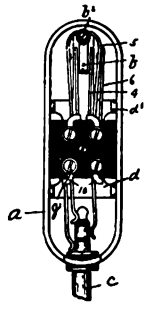
849,939. Groundwire Attachment.—C. L. Tichenor and C. D. Stoneburner, Washington, D. C. Filed March, 1906. A clamp for gripping a water or gas pipe. Has a hole and binding screw for attaching the ground wire.

850,064. Apparatus for Measuring Electric Capacity.—Harry Shoemaker, Jersey City, N. J. Filed October, 1906. (See cut.) In connection with the vibrator a circuit is given for the discharge of the capacity at every vibration.

850,079. Repeater System.—N. G. Warth, Columbus, Ohio. Filed February, 1907. (See cut.) The novelty is in the circuit arrangement. The repeating link is in two symmetrical halves, each employing a mechanical repeating device having a double-wound receiver helix.

850,311. Annunciator.—J. L. McQuarrie, assignor to Western Electric Company. Filed October, 1905. A combined relay and lamp signal.

850,344. Telephone System.—E. E. Clement, Washington, D. C. Filed March, 1905. A divided-multiple system. The calling subscriber may set his calling signal at any one of several switchboards. A manual Y-switch also is shown.



849,615

850,349. Circuit for Coin Collectors.—Henry M. Crane, assignor to Western Electric Company. Filed February, 1906. Two coin positions are shown, with means for controlling the coin in either position.

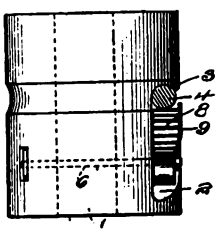
850,352. Circuit for Coin Collectors.—H. D. Currier, assignor to Western Electric Company. Filed February, 1906. Three coin positions are shown with means for controlling the coin in any position.

850,402. Relay.—C. E. Scribner, assignor to Western Electric Company. Filed March, 1906. (See cut.) The novelty lies in the back adjustment of the armature.

850,433. Telephone Apparatus.—Koby Kohn, New York, N. Y. Filed October, 1903. A lockout party line system using a metallic circuit for talking and enabling one user to lock out all others from the line.

850,434. Telephone Apparatus.—Koby Kohn, New York, N. Y. Filed February, 1904. A modified form of above.

850,470. Trunk.—W. W. Dean, assignor to Kellogg S. & S. Company. Filed July, 1902. A single-track trunk for Kellogg multiple switchboards.



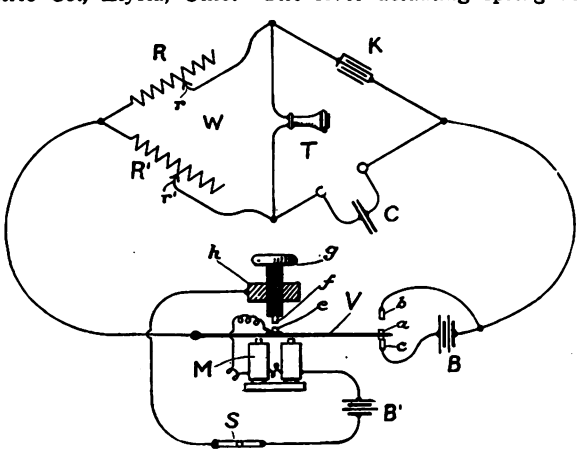
849,896

850,484. Telephone Repeater.—Charles Newman, Elizabeth, N. J. Filed June, 1906. This is a mechanism suitable for use with any repeater circuit. A movable stylus rests in contact with a smooth phonographic cylinder; the receiver helix presses the stylus against the cylinder and the sidewise drag of the stylus by the rotating cylinder operates a variable resistance to repeat the speech.

850,558. Attachment.—Mortimer H. Black, Pittsburg, Pa. Filed March, 1907. A receiver holder arranged for attachment to the case of a transmitter, and adapted to hold the receiver for either ear of the user.

850,625. Apparatus for Threading Conduits.—Thomas J. Cope, Philadelphia, Pa. Filed June, 1906. A machine for drawing the first wire into a duct, being propelled from behind to force its way through a duct by gripping the sides of the duct.

850,870. Hookswitch.—Ray H. Manson, assignor to Dean Electric Co., Elyria, Ohio. The lever actuating spring returns



850,064

its free end into a notch in the base whereby its motion is limited when the hook lever is removed.

850,886. Attachment.—Delzon G. Holby, Albion, N. Y. Filed May, 1906. A receiver supporting mechanism substituting a counterpoise for the receiver to operate the hookswitch.

851,051. Heat-coil.—A. H. Adams, assignor to Western Electric Co. Filed October, 1905. A self-soldering heat coil of center-pin style is held within a sliding cap for insertion into the switch springs of the protector.

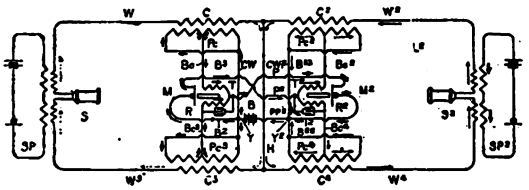
851,090. Telephone Meter.—Newman H. Holland, Brookline, Mass. Filed June, 1903. A substation meter actuated to record by reversal of current upon the telephone line, an automatic reversing means being provided at the central office for reversing the line upon the answering plug when the called party answers.

851,251. Coin Register.—Frank D. Powell and Charles S. Ellis, assignors to American Coin Register Co. Filed June, 1904. A coin registering device for coin collectors. Each coin passed into the cash box is impressed into a paper tape, the impression showing the character of the coin.

851,266. Call Device.—Franz Walloch, Berlin, Germany. Filed November, 1904. Detail of contact maker for subscriber's calling device for automatic systems.

851,355. Transmitter.—Stephen C. Houghton, Rome, N. Y., assignor to Wire & Telephone Co. of America, Rome, N. Y. Filed March, 1907. A perforated face plate for transmitter.

851,392. Arrester.—Alton W. Ball and Mark T. Seymour, Stow, N. Y. Filed October, 1904. It is disclosed that the spark or arc in an air-gap arrester tends to force the electrodes apart. A spring permits them so to separate and then to return. The life of the arrester is prolonged.

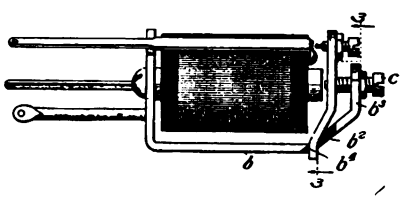


850,079

851,410. Heat-Coil Switch.—John Erickson, assignor to Automatic Electric Company, Chicago, Ill. Filed October, 1904. A specialized form of rotary self-soldering heat coil.

851,420. Electrothermal Switch.—Richard B. Hewitt and James G. Nolen, the latter assignor to Frank B. Cook, all of Chicago, Ill. Filed June, 1903. A sealed air chamber contains a heating coil, and the expansion of the confined air operates the switch.

851,458. Party-Line System.—Felton Vollmer, Winsted, Minn. Filed November, 1906. A system in which any station



850,402

may call any other, and in which disconnection is effected by time limit unless otherwise made.

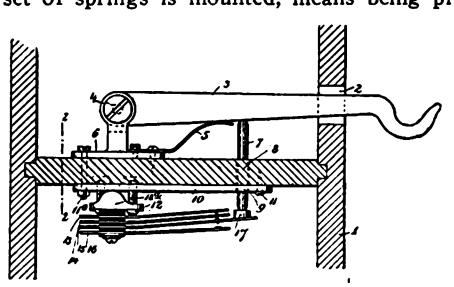
851,492. Arrester.—Russel R. Burrin and Theodore F. Gaebler, Rockville, Indiana. Filed January, 1906. An arrester equipment mounted complete in a weatherproof box integral with a pair of insulator knobs.

851,500. Trunk.—W. W. Dean, assignor to Kellogg S. & S. Company. Filed July, 1902. A double-track trunk circuit for Kellogg switchboards.

851,577. Pin.—David Weaver, Paterson, N. J. Filed July, 1906. A cross-arm pin having a shoulder to engage the upper surface of the cross-arm and having spring clips at the lower end of the pin to spread after the pin has been pushed through the hole in the cross-arm to prevent withdrawal of the pin.

851,747. Process of Drying Cables.—W. B. Hale, assignor to Western Electric Company. Filed March, 1906. A process of drying cables by passing current from one conductor to another to electrically decompose the moisture therein.

851,761. Hookswitch.—Alfred Larsson, Buffalo, N. Y. Filed May, 1906. (See cut.) The chief novelty lies in the block upon which the set of springs is mounted, means being provided for



851,761

adjustment of the set of springs with reference to the operating plunger by tilting the block holding the springs.

851,792. Telephone System.—Johan A. Aven, Stockholm, Sweden. Filed November, 1904. A call-distributing system, the line signals being removed from the multiple connecting switchboard entirely.

851,803. Trunk.—W. W. Dean, assignor to Kellogg S. & S. Company. Filed July, 1902. A double-track trunk for Kellogg switchboard systems.

851,838. Circuit for Coin Collectors.—John G. Roberts, assignor to Western Electric Company. Filed February, 1906. A coin collector operated by a magnet controlled from the central office is shown; a Wheatstone bridge circuit is built around the coin collector magnet to permit its operation by direct currents, but to prevent its operation by alternating ringing currents.

851,856. Composite Circuit.—Edward Blakeney, assignor to A. T. & T. Co. (Bell.) Filed January, 1907. The Bell Telephone Company uses the two sides of a telephone line independently for two telegraph circuits; this patent covers a method of preventing the telegraph currents of one side of the telephone line from interfering with the telegraph instruments of the other side of the telephone line.

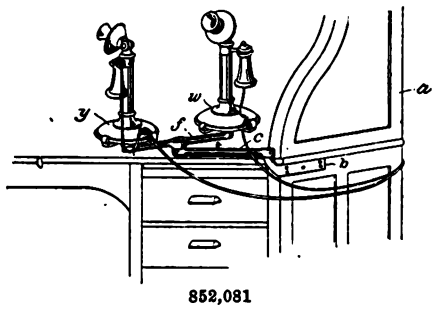
851,868. Lock.—E. B. Craft, assignor to Western Electric Company. Filed February, 1906. A screw-lock for telephone bell boxes.

851,948. Telephone System.—J. W. Lattig and C. L. Goodrum, Philadelphia, Pa. Filed April, 1903. A manual system for common battery multiple, using two-way cords and polarized supervisory relays in the cord pairs.

851,994. Switch.—Timothy S. Mount, Rhome, Texas. Filed September, 1903. In a telephone set having an extension or a private line as well as an exchange line, a switch is provided auxiliary to the hook switch whereby either line may be selected manually, the selecting switch being restored by the hook when the receiver is hung up.

852,004. Automatic System.—John Wicks and Donald D. McKay, Riverside, Cal. Filed August, 1905. A system of ringing two-party selective telephone lines in connection with Strowger automatic telephone switching apparatus.

852,081. Attachment.—Thomas J. Skelley, Collinwood, Ohio. Filed April, 1903. This telephone holder for attachment to a desk for holding desk telephone provides for the common condi-



852,081

tion of two telephone exchanges in one town by providing for holding the two telephone desk stands upon a swinging arm which advances one or the other for use, as needed. (See cut.)

852,148. Wire Connector.—Joseph S. Tucker, Chicago, Ill. Filed February, 1905. A connecting piece of wires; tapered bores receive the wires, which are bent back upon themselves to prevent withdrawal.

Second Annual Indiana Convention.

THE second annual convention of the Indiana Independent Telephone Association was called to order at the Claypool Hotel, Wednesday, May 15, A. C. Lindemuth, president, presiding. It was clearly indicated by the early morning attendance that the convention would be a record breaker. This was borne out before the session closed, because the official register showed a total of 308 visitors and delegates, 268 of which were operators.

The president of the association introduced Mayor Charles A. Bookwalter, who made the address of welcome, which was responded to by the president of the association. President Lindemuth congratulated the association on its unusually large representation, and remarked that such meetings were not only instructive and beneficial from every point of view, but that they inspired those who attended to become broader and better business men. He knew of no better way in which to extend the acquaintance, enlarge the experience and develop the social qualities among men engaged in similar lines of work, than convening at regular intervals. In referring to the association's work of the year, President Lindemuth said that the progress of the Independent telephone interests in Indiana had been both brilliant and notable; that the onward march toward the more complete occupation of the field was everywhere evident; that many new plants had been established; many of the older companies had erected new and substantial buildings, installed additional miles of underground cables and otherwise improved their systems with modern apparatus. Referring further to the record for the year, the speaker said:

"The progress of the Independent telephone movement in the state during the year has been pre-eminently satisfactory. We are greater and stronger than ever before. No defection into the ranks of the Bell worth mentioning have occurred. On the contrary, numerous companies that had a taste of the beauties of the Bell sub-license experience have cut loose and returned to the strictly Independent relation. It is safe to say that every Independent company in the state has been approached by Bell representatives during the year—some once and others many times. The meager success speaks volumes for the wisdom and loyalty of the Indiana Independents.

"Twenty-seven additional companies have joined the state association during the year. This increase is certainly very gratifying. At this rate in a few years every Independent company in the state will be joined in a compact organization easily able to protect itself and shield the public from the encroachments of unscrupulous competition. There are 182,000 Independent telephones in use in the state, while the Bell and sublicensee telephones in the state number only 45,000. The value of Independent property in the state as shown by the returns to the state tax board is $20,000,000 and the gross income is reliably estimated at $3,280,164.

"The future policy of the Independents is plain and their ultimate success absolutely assured. The prejudice which has grown up against the opposition is wholly justified. The Independents have succeeded because they deserved to succeed. But to make that success permanent two things must be regarded. First, the people must not forget their benefactors and by restrictive and unwise legislation reduce the rates for service below that which is commensurate with the greatly increased service and the high price of labor and material; second, as the Independent companies grow large and strong they must not become unmindful of the rights of the public."

The roll call of the various districts in the state showed that every district was represented. Applications for membership of 25 companies were referred to a committee with instructions to investigate their eligibility under the provisions of the constitution.

Owing to a meeting of the general executive board of the International association, representatives of other states were quite prominent at this convention. The board met in Indianapolis because it had business in hand toward arranging the program for the International convention.

The following report was made by a delegate representing the first district of the state:

"The first district now has 45 exchanges with 19,304 telephones, an increase of six exchanges and 3,953 telephones during the year. The Central Union Telephone Company has but six exchanges in the same territory and less than 3,000 telephones. During the year $150,000 was expended by the Independent companies in this district for new construction, this sum including $30,000 for a new direct toll line between South Bend and Logansport for direct service to Indianapolis and southern Indiana.

"The Central Union, or Bell interest, has not made any perceptible gain during the year in this territory. In Mishawaka, where it spent about $60,000 for a new up-to-date, central energy plant, having reconstructed its old system, it now has less than 300 telephones in operation. Most of their telephones were ordered out, when at the end of six months of free trial service, the company wanted to begin collections. Owing to better service and larger telephone list the people say they would rather pay more for a Home telephone than to pay a reduced rate for the Bell telephone.

"The Bell people have virtually met with the same defeat all over the district and there is not a single place where they are today earning any money in our territory. All telephones that are being installed by the Bell Telephone Company are admitted by that corporation to be at a price less than operating expenses. The Independent telephone companies have no reason to be alarmed as to what the Bell monopoly can do, for the reason the moment the latter corporation desired to place its business on a paying basis by raising the Bell rates the people would at once rebel and discontinue every telephone the Bell company has in operation."

The district included the counties of Elkhart, Fulton, Laporte, Kosciusko, Marshall, Porter, Stark and St. Joseph. It had been rumored prior to the holding of this convention that the Bell Telephone Company had made overtures to the Independents, agreeing to abandon certain territory as operators, provided the Independents would turn over the long distance feature of the business. The convention developed the first definite statement of what the Bell company really proposed to do. The proposition follows:

First, the Bell would abandon all exchanges where the Independents admittedly have the best of the fight. The Bell will then connect its long distance wires with the local Independent exchange. The only points in Central Union territory not included in this offer are Indianapolis, Peoria, Toledo, Columbus and Dayton.

Second, in any city not mentioned above the Central Union will sell its local exchange at its value as an investment.

This group of cities and towns includes places where the Bell admittedly has the best of the fight. The Central Union will continue its toll line arrangement with these exchanges.

The result of the discussion which followed showed conclusively that the Independents were opposed to any plan of consolidation.

Among those who spoke briefly on this topic were A. L. Tetu, who has recently resigned the general management of the Indianapolis Telephone Company and the New Long Distance Telephone Company to accept a position on the Pacific coast.

In speaking farewell words to the association Mr. Tetu sounded a warning against any proposition to "tie up" with the Central Union lines.

"A few nights ago at the Denison Hotel," said he, "I had a conversation with one of the Bell Telephone men. I asked him what it was going to mean to the Independents if this consolidation plan was put through.

"'Oh, h—l,' he replied, 'it simply means the disintegration of the state association.'

"And that," continued the speaker, "is the warning I sound to you."

James S. Brailey, president of the Indianapolis Telephone Company and the New Long Distance Company, and also head of the United Telephone Company of Ohio, strongly opposed any plan of uniting the two companies in Indiana. He hit the Bell system hard, declaring that it never fights fair. "Did any one," he asked, "ever hear of the Bell system fighting in the way that a competitor should fight? We always find it distributing the same old lies and the same old stories."

James P. Goodrich, chairman of the Republican state commitee, in an address on the topic, "Repairing Fences by Telephone," advised against consolidation. Goodrich is interested in the Independent movement in eastern Indiana. He regretted that some doubt has existed in the association as to whether some of the companies would tie up with the Bell concern. He believed this doubt had been dissipated by the remarks of President Brailey. "It is not a good thing," he declared, "for us to have distrust among ourselves."

A banquet was held on the evening of the first day's session which was very largely attended by association members and guests.

Thomas E. Davidson of Greensburg was toastmaster. At the top of the handsomely printed menu card were these words from the scriptures: "Their lines have gone out through all the earth."

The Apollo quartet, consisting of Frank N. Taylor, William Kopp, Clyde Ryan and Arnold Spencer furnished the music. One of the principal speakers was Col. J. D. Powers of Louisville, a pioneer in the Independent telephone movement in Kentucky. Col. Powers discussed "The Strenuous Life." He lamented that people did not have more confidence in the securities of the telephone companies and, in fact, of all public corporations.

Dwight E. Sapp of Mt. Vernon, Ohio, responded to the toast, "Buckeye Philosophy," saying "If we do not find the right man in Ohio we will come to Indiana for presidential timber."

M. L. Clawson's toast was "Opinions—Legal and Otherwise," and A. J. Payton of Rockport talked of "Change and Exchanges."

Second Annual Illinois Convention.

ONE hundred and fifty managers and chief operators of Independent telephone companies and exchanges in Illinois attended the second annual convention of the Illinois Independent Telephone Association, which convened in the club-room at the Silas hotel, Springfield, May 14-15. The early hours were spent in the reception of members by the local committee at the St. Nicholas hotel, the registering of members, enrolling new members and the committee meetings. Almost all the large rooms on the first floor of the hotel were occupied with the exhibitions of manufacturers of telephones and telephone supplies.

The morning session of the convention was presided over by W. H. Bassett, of St. Louis, Mo., traffic manager of the Kinloch Independent Telephone Company, in the absence of both Edward R. Conklin, of Aurora, president of the association, and Manford Savage, of Champaign, the vice-president. The time was spent in the appointment of committees and preliminary work. Charles B. Cheadle, of Joliet, secretary of the association, stated that he had prepared a list of fifty questions and had sent letters to eighty-three members of the association assigning to them questions which they were to take, in some cases two persons being assigned to the discussion of one question.

Secretary Cheadle also read an invitation from the Chicago Commercial Association, inviting the association to hold the next annual meeting in that city. The communication was referred to the executive committee with power to act.

The afternoon session was called to order by Vice-President Savage, who had arrived at noon, and who presided over the session.

The first number on the program was the address of welcome, delivered by Mayor Griffiths. He stated that he had been pledged to welcome all conventions to the capital city and could keep his pledge in this respect throughout his entire term of office.

He reviewed the city as an historical center and also as an interruban center. He claimed that Springfield was the best convention city in the State of Illinois, and judged from the applause given him, the delegates to the convention thought likewise. He requested the members to come to Springfield ever afterward, and assured them that every possible accommodation would be made for their reception.

Competition in telephone business is a good thing, according to the address of the mayor. He said it helped reduce rates and was a means of securing better service for the patrons of the two or more lines in competition.

On behalf of the association, Vice-President Savage, of Champaign, thanked the mayor for the address of welcome. He appreciated the hospitality shown the members of the association by the city in general and stated that the members would not soon forget the generosity of Springfield.

Speaking along the lines of the telephone business, the vice-president stated that the telephone was no longer a luxury for the wealthy, but was a necessity for the common people as well as the wealthy. Competition had increased the number of telephones in the country wonderfully. Where there were tens of thousands of telephones formerly, there are now hundreds of thousands in use daily.

Col. J. H. Hackett, of Jacksonville, was the first on the afternoon program in the matter of reading a paper before the convention. His topic was "The Past and Present Conditions of the Telephone Business." It will be found in another portion of this issue of SOUND WAVES.

The next speaker of the afternoon was J. S. Dailey, of Chillicothe, his address being entitled, "The Fallacy of Free Exchange and Cheap Switching." His address is printed elsewhere in this issue.

In the afternoon, Miss T. Barnes, chief operator of the Springfield office of the Inter-State Telephone Company, gave a school of instruction for the operators of the Independent systems who attended the convention. Miss Barnes is among the best posted chief operators in Illinois, and she was eagerly followed throughout her half hour's demonstration. Miss Barnes' address is printed in full in this issue.

In the evening a theater party was given by the association in honor of the visiting delegates. The party occupied the greater part of the first floor of the opera house and formed a feature of the performance. Each delegate was furnished with a badge of the association, each badge being numbered and a key given to the delegates, in order that the names might be readily distinguished. Another souvenir of the convention was a gold pin, bearing the shield, the emblem of the association, which was presented to every delegate.

A stereopticon lecture on "Fighting the Octopus," was delivered by J. H. Shoemaker, of Waterloo, Iowa, but the time allotted to it seemed all too short and on account of the theater party, many of the delegates were missing.

SECOND DAY'S SESSION.

In order that many of the delegates might be enabled to leave for their homes on the early afternoon trains, the election of officers of the association was held at the morning session, instead of carrying the election over to the afternoon.

There was no contests for any of the offices and all nominations were made unanimous.

Manford Savage, of Champaign, the former vice-president of the association, was elected president. In his speech of acceptance, he stated that there was more fun and amusement in the telephone business than any business known. Driven together by opposition, the speaker stated, the Independent companies have as strong feeling of fellowship as the old soldiers.

William H. Bassett, of St. Louis, was placed in nomination for the vice-presidency by George H. Glass, of Pekin, and his name was accepted as that of the next vice-president. The election of Charles B. Cheadle, of Joliet, as secretary of the association was the signal for a great demonstration in his honor. He had long been classed as a hard worker in the interest of Independent telephony and was easily the favorite for re-election. C. S. Hankins, of Decatur, was re-elected treasurer.

The executive committee, composed of E. R. Conklin, of Aurora; C. B. Cheadle, of Joliet; C. S. Hankins, of Decatur; W. H. Bassett, of St. Louis, Mo.; C. O. White, of Princeton; Manford Savage, of Champaign, and J. W. Barrett, of Pekin,

was re-elected. There was but one change in the list of vice-presidents of the association. In the eighth district, G. L. Chapman, of Tuscola, was elected to succeed C. W. Shimley, of Casey. The vice-presidents of the association now stand: First district, A. J. Vernier, Kankakee; second district, Frank Zinnell, Savanna; third district, F. M. Ashe, Kewanee; fourth district, B. F. Wasson, Clinton; fifth district, J. S. Dailey, Chillicothe; sixth district, W. J. McQuiston, Monmouth; seventh district, W. H. Ramsey, Auburn; eighth district, G. L. Chapman, Tuscola; ninth district, W. H. Bassett, St. Louis, Mo.; tenth district, Hon. C. E. Hull, Salem; eleventh district, H. R. Aisthorpe, Cairo.

The matter of selecting a city for the third annual convention is in the hands of the executive committee.

The following resolution was adopted by the convention:

"Resolved, That it is the sense of this convention that the growing tendency of permitting the Bell Telephone Company to connect its toll lines with Independent switchboards is a practice we believe detrimental to Independent telephony, and should not be countenanced by this association."

It was greeted with a storm of approval by the delegates.

A committee to establish toll rates between the various companies was named by the acting president, and is composed of James W. Barrett, of Pekin; L. A. Herrick, of Freeport, and Edward D. Glandon, of Pittsfield. A uniform scale will be adopted and the report of the committee will be made in the near future.

Before adjournment was taken, a vote of thanks was extended to the city of Springfield and the officials of the capital city; to the management of the St. Nicholas hotel and the Silas hotel, where the sessions were held; to the manufacturers and supply houses for their generous support and to Miss T. Barnes for her school of instruction to the delegates.

The Missouri Convention.

THE annual convention of the Missouri Independent Telephone Association was held at the Coates House, Kansas City, May 8th and 9th, and was an unqualified success. The attendance was the largest in the history of the association, and enthusiasm knew no bounds. The prospects for Independents in Missouri are very bright.

The program for the first day included papers entitled "Independent Long Distance Companies and Their Co-operation With Local Companies," by W. H. Bassett; "Telephone Laws and History," by Houck McHenry; "Taxation of Telephone Properties," by S. T. Neill; "Local Telephone Operation," by W. B. Bentley. Dr. Neill spoke from notes.

The convention was called to order by the president of the association, who introduced Mayor H. N. Beardsley, a portion of whose address follows:

"Telephone men, I have been listening since I came here to the hum of your voices and recognize that it is altogether a distinct sort of a tone, and of a more masculine note than we usually hear in telephone circles.

"I am glad this morning to be here and in a representative capacity to bid you welcome to Kansas City and to your convention. I want you to feel in the few words that I have to say that I am simply a voice, although I am here in my own person, and that all of the citizens of Kansas City are speaking that welcome to you through me and through my voice.

"We are glad to have you come to this convention. This is an age of conventions. While you are here we want you to recognize the fact that we feel proud of Kansas City; there is a different spirit in the air today from what prevailed a few years ago; I appeal to you if it is not true. Go back a dozen years and there was a spirit of gloom and despondency. We know what conditions are in our great cities and there seemed to be a popular belief we could never be any better; cities had to be filled with slums and all sorts of crime and wrong and objectionable things. Today we are going out of that, hoping and believing there is a better life.

"It is not merely what we can get out of life for ourselves, but what we can do altogether pulling for better things. That is the spirit we are proud of and which will prevail in your convention. We want to build up this great Independent system which you are proud of, and ought to help render better service.

"While you are in the city make yourselves at home; I hope none of you will get into trouble, but if you do, let me suggest to you I have unlimited pardoning power and I will exercise it on your behalf."

President Scruggs responded to the mayor's address of welcome in chosen language fitting the occasion, and then delivered his annual greeting to the association, which follows in full:

Gentlemen of the Convention Assembled: So many things have transpired since our last meeting in February, 1906, that I hardly know where to begin. So many new conditions have arisen, so many new franchises granted in large cities; the great demand; the rapid growth of every exchange, both large and small, and last but not least, the amazing growth of rural and mutual lines. Before passing on I wish to give my conclusion of the mutual situation, after being in close competition with them for three years and after much study of the situation from every point of view. This subject has occupied our time and caused more discussion in conventions than any other subject:

1. For the reason that many exchange owners thought they were going to be ruinel by them, and,

2. That they were unfair competitors because they charged nothing for their service.

3. Because everybody wanted telephones and that they had the only plan by which every one could have a telephone in the rural districts, so far as we were concerned, because of our capital. Now I propose to take this position that they are a benefit and an absolute necessity, that they have helped us to win a great fight, and without them nine-tenths of us could not have supplied the demand that was thrust upon us in such a short time. You will certainly agree with me when I say that the situation looks as though every house was going to have a telephone before there will be any let-up to the demand. If this be true, then figure what would have been the result if the proposition would have been put up to the Independents and our competitor, the Bell company, to furnish this service. I claim with conditions that have confronted us both for the past five years, a large portion of these that are now supplied in this way would not have been taken care of yet.

Now we have this condition: Ninety per cent of the farmers who have telephone service either get it from Independent concerns or of the Mutuals, and a very small per cent of the Mutuals have any other than Independent long distance connections. As long as this condition exists we hold the winning hand. The Independent concerns now have on their boards nearly all the farmers that can afford to pay a rate that is profitable to the exchange owner; this is not entirely true, but nearly so, and they are helping us. Then why any farmers' company should identify itself with the Bell Company almost passes human understanding, because in its organization and methods the Bell stands for everything that is on general principles denounced by the liberty-loving American farmer, and he is wise enough to know that when he destroys Independent telephone concerns his last hope is gone so far as getting cheaper rates are concerned. I want to say to you, gentlemen of the convention, this is not what we are most interested in. The vital question at issue is organization. What we must have is better organization. Mr. Gary has gone into this subject very thoroughly, for which I am very thankful.

Take any of the large industries of this country and when you point to their success you will at once discover behind them a well organized working business organization both with labor as well as capital. I might say like one of our distinguished statesmen, "there may be good organizations and bad organizations, but we have a legitimate business and we have a right to a legitimate business organization." I fear a great many of us do not appreciate this fact as we should in these days of sharp competition. To succeed, each line of industry must be organized, and ours is no exception to the rule. Take the implement dealers, the lumber dealers, the millers, the bankers, and hundreds of others too numerous to mention, even our friends, the Bell company, has one of the strongest organizations in the country unless it is the Standard Oil. Some of you may not have received a circular letter I sent out last week showing what organization has done for Independent telephony in Ohio and Indiana. Here is a clear case of good business management and a thorough organization. The facts are that the Independents have made it almost impossible for the Bell Company to do business in those two states and now it is seeking a compromise. It offers to give up certain fields for local business if the Independents will give it the toll business. It is remarkable, to say the least, that such a condition could be brought about in so short a time, after a monopoly of twenty years in which to entrench. I am willing to take my part of the blame for our state not being as well organized, but we can and must bring about this condition right here at home. I do not mean by this to cast any reflections on this association or any of its members, for I believe, considering that we have only been organized two years, we are second to none in the country. And I am proud to say that we have as shrewd a lot of exchange managers in this state as there are to be found in the country. We also have in our ranks many of the leading telephone men in the United States, and their ability has been recognized by the International association, of which they are also members. I had expect Mr. James B. Hoge, president of the International association, would be present at the meeting, but he failed to arrive. We will no doubt have the pleasure of hearing him on this important subject. We have with us some of the officers of the Kansas, Nebraska and Iowa associations who will address you during the convention. They all have very strong state associ-

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ations and I know they will join with me in appealing to you along this line.

Now in order to do this we must have funds to work with. We must be in a position to contribute to the International association, for it is performing a great work and we must assist. We need more money to make the proper kind of a campaign. You must pay your dues promptly. You must attend the state as well as the district meetings and you must perform your duty as a member whenever called upon. We must not shirk our duty one minute and I feel that none of you will.

Adverse legislation has been running rampant in our state for many months. The Bell Company has done its part to help check it, but the power to do this successfully did not lay with it at all; in fact, the Independents have the real influence and can receive more consideration from Missouri lawmakers than the Bell can, ten to one. I also wish to compliment the Independent companies of the large cities for their efforts along this line, for I am sure they did all that was in their power to do.

Did it ever occur to you that telephony was one of the best business enterprises in the land? In the short space of ten years over $300,000,000 has been invested in Independent telephone properties. In this short space a few factories making only a small number of telephones have grown to hundreds in number and making over a million telephones per year. There is always a reason for everything. Exceptional opportunities for both small as well as large investors is the cause. There is less fluctuation than in any other line of business. There is more demand with less effort than in any other line of business. When your subscriber seeks to economize, the telephone is the last article to dispose of. It is as much of a fixture now as the clock on the wall, and cannot be dispensed with. Strikes, crop failures and hard times may come and go, but the telephone works right along, night and day. For this reason alone, gentmen, we should never have the least apprehension regarding our telephone investments. The only question today, that is at all worrying any operating company, is being able to supply the demand for our goods. This is as much true of the Bell Company's condition as ours, only worse, I think, but this condition is changing in our favor. The investing public is beginning to understand that telephone securities form one of the safest kinds of investments. The depression which has prevailed for the past few months was caused by injudicious attacks which injured those who made them more than the companies at which they were aimed. I refer to the U. S. I. deal in Rochester. The Bell company has now withdrawn its offer to purchase this company, and a reorganization committee is being appointed by the interested parties of the U. S. I. affairs, and the entire system will remain Independent.

Without organization the Independents would have been helpless in the situation, hence, whatever may be the final decision of the courts, the fact remains that the association is looked upon as a power by the opposition and by the commercial and financial interests of the country. It is the hub around which the Independent cause revolves; and as long as its movements are directed by such able men, its existence is absolutely essential to the progress of the movement.

Sixty days ago our committee met here and decided tc send out a traveling secretary to visit each district and hold meetings in each of them, and to give them special invitation to attend the state meeting on this date. He reported to me that at some of the meetings the attendance was not as large as he had expected, but everybody said they were coming to the state meeting. Now, to my mind this was one of the very best indications that the situation over the state is in first class shape. Where we have exchanges at all, the very fact that they did not attend these meetings in great numbers is very conclusive evidence that each company has its own situation well in hand, or they would be clamoring for assistance and attending every meeting they could hear of in the hope of finding out some method of relief. There is not one instance in the state in the territory reached by the two big long distance companies that we have not a majority of the business. What better situation could we ask?

Before the meeting adjourned for the forenoon the following resolution was adopted:

WHEREAS, The Missouri House of Representatives on the 7th day of May, 1907, passed a bill fixing long distance telephone rates; and

WHEREAS, The rates named in said bill are an average reduction of about 30 per cent on the present established rates; and,

WHEREAS, Said bil is now pending in the state sentate, therefore be it,

Resilved, By the Missouri Independent Telephone Association in annual convention assembled:

1. The rates for long distance telephone service have been reduced by competition during the past few years to such an extent that there is now but a small margin of profit in the business.

2. If said bill be enacted into a law the effect will be not only to deprive the owners of toll lines of all profit whatever, but will inflict serious and irreparable loss. That it wil stop further telephone development, impair the present service, and result in great injustice to thousands of citizens of our state who now have their money invested in telephone property.

3. This assosiation, representing more than four hundred separate companies located in all parts of Missouri, and representing millions of dollars of investment of citizens of Missouri earnestly protest against this measure, and call upon our senators to defeat its passage.

The afternoon session was given over to the several papers on the program, and discussions which they precipitated.

At the morning session of the second day, President J. B. Hoge of the International association addressed the convention and urged a full attendance of the Missouri delegation to the International convention. Mr. R. E. Mattison, secretary of the Nebraska association, also addressed the meeting.

The afternoon of the second day was devoted to hearing the reports of the various committees and the election of officers, which follow:

President, Houck McHenry, Jefferson City; secretary and treasurer, George Schweer, Windsor; delegates to the International convention, H. Linton Lieber, St. Louis; Dr. S. T. Neill, Clinton; A. W. Davidson, Hannibal; Houck McHenry, Jefferson City, and M. L. Golladay, Holden.

Before the adjournment a resolution was passed by the convention inviting all Independent telephone people in the state to attend the next convention, which will be held at the Coates house in Kansas City next spring. This will include persons having party line telephones in the rural communities, and will be the first time the smaller exchanges have been invited to attend a telephone convention of this sort.

The convention ended with a banquet at the Coates house. About 250 telephone men sat down to the table. The menu card was unique in one respect: Each dish was given some name technically significant to the trade. Mayor H. M. Beardsley, James A. Plotner and James A. Reed, Kansas City; Dr. S. T. Neill, Clinton; N. J. Roth, Chicago, and M. L. Golladay of Holden were the principal speakers.

Personal.

S. A. Duvall has joined the sales force of the Swedish-American Telephone Company.

John Eckhoff, of Marshfield, has purchased the local Independent exchange at Wittenburg, Wis., and will improve the service.

Frank Stanfield, of LeGrand, Iowa, has purchased the properties of the Mutual Telephone Company, which formerly operated here.

F. H. White has resigned as manager of the local branch of the Union Telephone Company, of Bradford, N. Y., and will locate elsewhere.

S. C. Harvey, who has been representing Frank B. Cook on the Pacific Coast, has returned to take Indiana and Ohio as his territory.

E. E. Dewey is representing Frank B. Cook in the sales department. Mr. Dewey was formerly with the American School of Correspondence.

A. M. Sick, formerly with the National Cash Register Company, has accepted a position with the Century Telephone Construction Company.

Julius Lanterman has resigned his position as manager of the Zinnel Telephone Company, at Milledgeville, Ill., and will be succeeded by A. J. Miller.

Ed. T. Purcell has resigned his position as manager of the Saline County Telephone Company, at Marshall, Mo., and will be succeeded by Edgar P. Miller.

E. L. Swaine, general manager of the Home Telephone Company, of Los Angeles, Cal., has tendered his resignation to take effect June 1, on which date he will assume the presidency and general managership of the Southern Telephone Electric Company.

R. L. Mitchell, who for the past two years has been manager of the Citizens' Telephone Company in Houston, has resigned. President Frank C. Smith, of the company, whose headquarters are in San Antonio, has arrived in Houston and taken charge of the affairs of the local office.

W. A. Taylor has accepted a position as mechanical engineer with the Canadian Independent Telephone Company, with headquarters at Toronto. Mr. Taylor has had a very large experience with Independent manufacturers in the United States and is well qualified to assume his new duties.

C. H. Macklin, for a number of years associated with the Swedish-American Telephone Company, occupying positions of great responsibility, has associated himself with the Century Telephone Construction Company, with headquarters in Buffalo. Mr. Macklin's large acquaintance among Independent operators is in itself a valuable asset. His many friends will wish him unbounded success with his present connections.

A. L. Tetu, general manager for the New Long Distance and the Indianapolis telephone companies; Arthur A. Berridge, auditor for both companies; and C. J. Langdon, superintendent for the Indianapolis Telephone Company, have resigned and will go to Portland, Ore., to associate themselves with the Home Telephone Company, of Portland, in the same respective capacities as they filled with the Indianapolis companies.

THOMAS G. GRIER gave a dinner at the Chicago Athletic Club, Tuesday night, June 4th, to electrical salesmen of representative houses. The event was heartily approved by the large number of guests, who were unselfish in their praise of Mr. Grier for his hospitality. We had hoped to have a photograph of the banquet in order to show the readers of SOUND WAVES an illustration, which would tell more forcibly than mere words, what the occasion portrayed. We recall no similar event where such good fellowship had for its single purpose the boosting of one man's endeavor. As host, Mr. Grier can not be excelled and, judged by the uniform testimonial of his friends, as a business man he exceeds his ability as host.

Frank W. Pardee has severed his connections with Frank B. Cook to enter actively into the work of the Durant Electric Supplies Company, a concern in which he is financially interested. About the time of his retirement, Cook employes of the office and shop tendered him a surprise party dinner at which they presented a beautiful gold watch appropriately inscribed. During Mr. Pardee's long association with Mr. Cook he became very closely identified with the telephone business. In the capacity of Mr. Cook's manager, a very large portion of the details of the business fell to him. In his new capacity he becomes associated with Messrs. Durant, Crook and Dewey, all young men with a large following in Independent telephony.

Epitome of the Month

NEW COMPANIES.

DAVENPORT, Ia.—The Scott County Telephone Company has been incorporated.

GIG HARBOR, Wash.—The Bay Island Telephone Company has been organized here.

WEST ALEXANDER, Pa.—The Farmers' Mutual Telephone Company has been incorporated here.

LAKE VIEW, Minn.—The Lake View Farmers' Mutual Telephone Company has been formed.

BROOKVILLE, Ind.—St. Peter's Telephone Company has been incorporated, with a capital stock of $10,000.

CASS CITY, Mich.—The Cass City Telephone Company has been incorporated, with a capital stock of $5,000.

WHITEWATER, Kas.—The Whitewater Telephone Company has been incorporated, with a capital stock of $40,000.

SYRACUSE, Kas.—The Bear Creek Telephone Company has been incorporated with a capital stock of $5,000.

BENAVIDES, Tex.—The Benavides Telephone Company has been incorporated, with a capital stock of $5,000.

MCCALLSBURG, Iowa.—The Short Line Telephone Company has been incorporated, with a capital stock of $5,000.

RUSH CENTER, Kas.—The Rush Center Telephone Company has been incorporated, with a capital stock of $5,000.

MAYFIELD, Ky.—The Panther Creek Telephone Company has been incorporated, with a capital stock of $12,000.

FOREST, N. Y.—The Forest Telephone Company, Clinton county, has been incorporated, with a capital stock of $4,950.

BEAVERLAKE, Pa.—The Sullivan & Money Creek Telephone Company has been incorporated, with a capital stock of $10,000.

DENTON, Neb.—The Kramer-Denton Telephone Company has been incorporated to operate here. The capital stock is $25,000.

CALAMUS, Ia.—The Farmers' and Business Men's Mutual Telephone Company has been formed, with a capital stock of $9,996.

MOORE, Mont.—The Judith Telephone Company has been incorporated, with a capital stock of $10,000, by G. M. Stone and others.

CHILLICOTHE, Tex.—The Independent Telephone Company of Chillicothe has been incorporated, with a capital stock of $2,500.

ULYSSES, Pa.—The Ulysses-Loucks Mills Telephone Company has been organized to build a telephone line between the two towns.

HARRISBURG, Pa.—The Sullivan and Muncy Creek Telephone Company has been incorporated, with a capital stock of $10,000.

IOWA CITY, Ia.—The Jefferson Township Farmers' Mutual Telephone Company has been incorporated, with a capital stock of $3,000.

HYANNIS, Neb.—The Hyannis Central Telephone Company has been incorporated and the village has granted it an exclusive franchise.

WESLEY, Ia.—The Wesley Rural Telephone Company has been incorporated, with a capital stock of $2,000, by O. K. Floran and others.

FAYETTE, Mich.—The Farmers' Co-operative Telephone Company has been organized to operate a line extending from this place to Garden.

SOLON, Ia.—The Farmers Mutual Telephone Company has been incorporated, with capital stock of $3,000, by F. Noveland and others.

WALNUT, N. C.—The Walnut Telephone Company has been incorporated, with a capital stock of $2,000, by A. D. McDevitt and others.

BELMORE, Ohio.—The Belmore Mutual Telephone Company has been incorporated, with a capital stock of $2,500, by G. H. Bach and others.

HOWELL, Ohio.—The Rankins Creek Telephone Company has been incorporated, with a capital stock of $1,000, by Newton Kite and others.

MAGNOLIA, Ark.—The Magnolia Telephone Company has been organized, with R. L. Morris, president, and Gus Kohn secretary and treasurer.

IOWA CITY, Ia.—The Scott Township Telephone Company has been incorporated, with a capital stock of $2,500, by A. E. Barnes and others.

GUTHRIE, Ohio.—The Guthrie, Iron Mound and Cedar Townships Telephone Company has been incorporated by J. L. Christy and J. P. Thomas.

WINONA, Mo.—The Current River Telephone Company has been incorporated, with a capital stock of $10,000, by J. V. Chilton and others.

ACTON, Tex.—The Acton Telephone Company has been incorporated, with a capital stock of $8,125, by G. W. Carmichael, J. N. Ratliff and others.

CASTLE DALE, Utah.—The Green River Telephone Company, recently incorporated, has been granted a fifty-years franchise to operate in Emery county.

DWIGHT, Mo.—The Home Telephone Company has been incorporated, with a capital stock of $1,500, by R. E. Bunting, John Hoffman and M. B. Butz.

CASS CITY, Mich.—Twenty farmers southeast of Cass City have organized the Evergreen Mutual Telephone Company, with Isaac Cragg as president.

COLFAX, Wash.—The Lone Pine Telephone Company has been incorporated, with a capital of $1,200, by Wm. Richardson, E. L. Ross and H. E. Davis.

GLENDALE, Ore.—The Glendale Telephone Company has been incorporated, with a capital stock of $5,000, by A. F. Sether, E. B. Stewart and B. L. Darley.

INDUSTRY, Ill.—The Industry Telephone Company has been incorporated, with a capital stock of $6,000, by R. F. Butterfield, J. P. Young and Fred Recroat.

TRIVOL, Okla.—The D. B. Mutual Telephone Company has been incorporated, with a capital stock of $2,000, by J. L. Porter, J. A. Jones, Alfred Dorett.

FULTON, Mo.—The Fulton Telephone Company has been incorporated, with a capital stock of $2,500, by W. H. Durkee, Robert Ritchie and Garrett Haniga.

BANCROFT, Neb.—The Bancroft Telephone Company has been incorporated, with a capital stock of $7,000, by J. H. Farley, E. M. Farley and C. A. Donohoe.

CASHION, Okla.—The Spring Creek Telephone Company has been incorporated, with a capital stock of $500, by A. Cowell, G. W. Geybert, C. C. Comforth.

JEFFERSON, Wis.—Jefferson Mutual Telephone Company, capital stock $10,000, has been incorporated by John M. Bienfang, R. B. Hellen and O. F. Roessler.

CESTOS, Okla.—The Independent Telephone Company has been incorporated, with a capital stock of $25,000, by H. A. Seaton, J. W. Kerns and F. C. Hoyt.

MERIDIAN, Okla.—The Meridian Rural Telephone Company has been incorporated, with a capital stock of $3,000, by W. H. Allen, W. Ridestein and J. M. Heath.

BURNETT, Tex.—The Smart Telephone Company has been incorporated, with a capital stock of $2,000, by J. T. Littlefield, A. Burger, H. and C. C. Smart.

FOND DU LAC, Wis.—The Woodhull Telephone Company has been incorporated, with a capital stock of $2,500, by J. A. Stratz, Frank Schaefer and O. S. Fenner.

ALINE, Okla.—The Valley Green Telephone Company has been incorporated, with a capital stock of $1,000, by F. M. Riburn, J. H. Elkins and J. D. Durham.

YUBA, Wis.—The Pine River Telephone Company has been incorporated, with a capital stock of $1,500, by M. B. Lewis, John Fonts, B. K. Borland and others.

HAMBURG, Wis.—The Hamburg Telephone Company has been incorporated, with a capital stock of $3,000, by M. B. Rosenberry, C. B. Bird and A. L. Kruetser.

TEXHOMA, Okla.—The Texhoma Telephone Company has been incorporated, with a capital stock of $5,000, by S. J. Osborne, T. E. Osborne and Gertrude Osborn.

SPRINGTOWN, Tex.—The Springtown Telephone Company has been incorporated, with a capital stock of $5,000, by J. T. Robersin, W. A. White and C. Malone.

LANARK, Ill.—The Lanark Mutual Telephone Company has been incorporated, with a capital stock of $12,000, by George W. Michael, Daniel B. Stitzel and John R. Wolf.

VICI, Okla.—The Vici Rural Telephone Company has been incorporated, with a capital stock of $5,200. Directors: O. W. Hauser, D. J. Schramburg, E. A. Speck.

COLBY, Wis.—The Colby & Southwestern Telephone Company has been incorporated, with a capital stock of $600, by Louis F. Frome, Henry A. Frome and A. K. Andrews.

LIBERAL, Mo.—The Liberal Mutual Telephone Company has been incorporated by C. Lipscomb, C. A. Smith, J. G. Todd, A. S. Harvey and others. Capital stock, $2,050.

AHNAPEE, Wis.—The Kodan Telephone Company has been incorporated, with a capital stock of $1,000; incorporators: Edwin Maedke, Jacob J. Blahnek, and Fred C. Weise.

QUARRY, Wis.—The Quarry Riverside Telephone Company has been incorporated, with a capital stock of $2,000, by Ole Lotten, A. H. Alfrom, K. H. Thompson and others.

NORTON, N. D.—The Norton Farmers' Telephone Company has been incorporated, with a capital stock of $10,000, by Harry Fletcher, Carl L. Johnson and Anders J. Bylin.

ORANGE, Wis.—The Badger Mutual Telephone Company has been incorporated, with a capital stock of $10,500, by G. B. Bailey, H. C. Abramson, H. J. Halberg and others.

HARDINSBURG, Ky.—The Union Star and Hardinsburg Telephone Company has been incorporated, with a capital stock of $500, by P. M. Beard, W. L. Milner and Jabez Haynes.

DRIFTWOOD, Okla.—The Citizens' Telephone Company of Driftwood has been incorporated, with a capital stock of $8,000, by W. E. Barkley, W. H. Cloyd and S. E. Lambert.

REEDING, Okla.—The Reeding Telephone Company has been incorporated, with a capital stock of $1,000, by G. T. Dixon, of Okarche, G. B. Caron and B. F. Cole, of Reeding.

BENTON, Ky.—The Kentucky Equity Telephone Company has been incorporated, with a capital stock of $4,000, by F. P. Humphrey, T. J. Cole and E. C. Phelps, of Benton.

EDINBURG, N. D.—The Edinburg & Tiber Telephone Company has been organized and the following officers elected: Henning Gunhaus, O. Fauskee, secretary and treasurer.

ALEDO, Ill.—The People's Telephone Company of Mercer county has been incorporated, with a capital stock of $3,500, by Peter F. Mauck, David N. Blazer and A. G. Reinolds.

CONSTANCE, Minn.—The Eastern Telephone Company has been incorporated, with a capital stock of $50,000, by A. W. Johnson, John Simonson and Fred Johnson, of Constance.

DOVER, Okla.—The Banner Telephone Company has been incorporated, with a capital stock of $500, by A. L. Hayes, L. Q. Bond, Fred Schilde, W. E. Sweetzer and W. H. C. Zion.

CYNTHIANA, Ky.—The Harrison County Co-operative Telephone Company has been incorporated, by W. M. Stewart, J. W. Snodgrass, H. D. Florence, Chris Hehr and S. H. Rankin.

WELLINGTON, Tex.—The Union Telephone Company has been incorporated, with a capital stock of $2,000, by J. T. Littlefield, A. Burger, H. A. Jones, Vol. Allen and P. W. Myers.

CARTER, Wis.—The Carter-Wabeno Telephone Company has been incorporated, with a capital stock of $4,000, by Norman W. Johnson, A. J. Johnson, E. Hemenway and W. S. Slater.

ROSCOE, Pa.—The Roscoe Telephone Company has been incorporated, with a capital stock of $5,000, by B. L. Lamb, W. C. Smith, T. J. Underwood, California; J. H. Underwood, Roscoe.

SCHLEISINGERVILLE, Wis.—The Washingon County Telephone Company has been incorporated, with a capital stock of $1,500, by John F. Kramer, Charles D. Storck and M. Maxam.

UNION, Mo.—The Commercial Telephone Company has been incorporated, with a capital stock of $8,000, by A. J. Gorg, A. E. Reinhard, A. F. Rauthe, A. Kramolowsky and O. E. Meyer.

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MOTLEY, Minn.—The Motley Local Telephone Company has been organized, with the following officers: V. Lockwood, president; G. D. Crossette, secretary; S. W. Jacobs, treasurer.

OKLAHOMA CITY, Okla.—The Twin Creek Telephone Company of Oklahoma City has been incorporated, with a capital stock of $50,000, by P. J. Petrastek, William P. and N. J. Reding.

REMSEN, Iowa.—The Remsen & Meadow Township Telephone Company has been formed, with the following officers: August Haack, president; Nic Land, treasurer; J. H. Ahmann, secretary.

UNION HILL, Minn.—The Union Hill Telephone Company has been incorporated, with a capital stock of $8,000, by C. A. Backman, Waterville; Joseph Widmer, E. M. Widmer, New Prague.

ONEIDA, Ill.—The Oneida Telephone Company has been formed and the following directors chosen: A. F. Hannam, A. J. Miller, A. D. Metcalf, G. L. Stephenson and J. F. Epperson.

CARYVILLE, Wis.—The Caryville Telephone Company has been organized, with the following officers: John Eddington, president; George Plumer, treasurer; E. Edwin Larson, secretary.

Owosso, Mich.—The Conway-Antrim Telephone Company has been incorporated, with a capital stock of $8,000. The company will run lines to Fowlerville, Byron, Morrice and Shaftsburg.

BUTLER, Mo.—The Mount Pleasant Mutual Telephone Company has been incorporated, with a capital stock of $2,400, by T. N. Ervin, E. D. Wilcox, Fred Church, M. C. Wilcox and others.

BRINSMADE, N. D.—The Brinsmade and Normania Telephone Company has been organized, with the following officers: Ed. Haney, president; John M. Anderson, secretary and treasurer.

WICHITA FALLS, Tex.—The Wichita Falls and Northwestern Telephone Company has been incorporated, with a capital stock of $10,000, by R. E. Huff, C. C. Huff and William McGregor.

PEKIN, N. D.—The Sheyenne Telephone Company has been incorporated, with a capital stock of $50,000, by F. W. McDougall, E. A. Olsgard, McVille; H. H. Kniefel, G. T. Mark.

CAPRON, Okla.—The Capron Telephone Company has been incorporated, with a capital stock of $7,000, by J. T. Fash, J. M. Daughette, C. E. Curran, Conrad Schwarz, J. C. Walker, Wm. Webb.

MOUNT PULASKI, Ill.—The Mount Pulaski Independent Telephone Company has been incorporated, with a capital of $5,000, by Herman Rentmeister, S. C. Lawson and William Baumann.

MERIDIAN, Miss.—The Mississippi Independent Telephone and Telegraph Company has been incorporated, with a capital stock of $50,000, by S. A. Jones, W. N. Ethridge, C. B. Luck and others.

PHILLIPS, Wis.—The Price County Telephone Company has been incorporated, with a capital stock of $10,000, by Roy L. Winchester, E. Vincent Covey, Ella V. Winchester and Lela A. Covey.

WEST PLAINS, Mo.—An Independent telephone company has been organized to build a system to Siloam. The officers are: W. H. Brazier, president; A. J. Noel, secretary; E. A. Wiggs, treasurer.

QUINLAN, Okla.—The Quinlan and Cedardale Free Exchange Telephone Company has been incorporated, with a capital stock of $5,000, by Ben Huff, Henry Lamsey, John Johnson and Samuel Catlett.

KING CITY, Mo.—The Karr Telephone Company has been organized, with the following officers: A. J. Holland, president; P. J. Woodworth, vice-president; A. L. Brooke, secretary and treasurer.

PORT WASHINGTON, Wis.—The Port Washington Telephone Company has been incorporated, with a capital stock of $5,000, by W. B. Krause, Henry Homes, A. H. Kuhl, J. W. Krause and L. H. Uselding.

SENECA, N. Y.—The Seneca Independent Telephone Company has been incorporated, with a capital stock of $10,000, by F. W. Gates, H. C. Gates, of Steamburg, and R. W. Crane and O. A Gates, of Red House.

DEGRAFF, Ohio.—A new telephone company has been organized here, with the following officers: J. F. Kinnan, president; J. D. Horn, vice-president; W. J. Dachenbach, secretary; J. S. Nichol, treasurer.

ETNA, Me.—The Etna Telephone Company has been incorporated, with a capital stock of $5,000. Officers: L. P. Toothaker, president; M. W. Toothaker, vice-president; A. L. Sylvester, secretary and treasurer.

DOTHAN, W. Va.—The Beckley and Fayetteville Telephone Company has been incorporated, with a capital stock of $5,000, by Frank Thompson, E. N. Case, Harrison Toney, J. W. Mahoney and J. W. Coleman.

LIDGERWOOD, N. D.—The Lidgerwood Rural Telephone Company has been incorporated, with a capital stock of $25,000, by Louis J. Christensen, John J. Mathews and Mary C. Christensen, all of Lidgerwood, N. D.

RUSSIAVILLE, Ind.—The Russiaville Co-operative Telephone Company has been incorporated, with a capital stock of $5,000. Directors: Albert Lindley, O. L. Evans, J. A. De Lon, A. E. Waters and A. C. Chaney.

READING, Pa.—The Mountain Telephone Company has been incorporated, with a capital stock of $5,000, Harvey W. Kemp, of Landis Store; Owen E. Soon, Horace F. Tyson and Samuel B. Lathshaw, of Barto.

MONIDA, Mont.—The Centennial Telephone Company, recently organized and incorporated for $20,000, will begin construction work in the very near future and will extend lines into the surrounding country.

PRINGLE, S. D.—The Point of Rocks Telephone Company, with lines extending into Custer and Hot Springs, has been organized, with the following officers: J. W. McClaren, president; R. J. Turner, secretary.

RAMSEUR, N. C.—The People's Telephone Company has been incorporated, with a capital stock of $20,000, by E. Watkins, J. W. Parks, N. F. Marsh, H. B. Moore, J. I. Lambert, W. D. Lane and M. E. Johnson.

PLYMOUTH, N. H.—The White Mountain Telephone Company has been organized, with a capital stock of $100,000, to operate throughout the county of Grafton. Nelson Bailey, of Wells River, is one of the directors.

Ashley, Mich.—The Ashley Rural Telephone Company has been organized, with a capital stock of $10,000, and the following officers: O. N. Fairbanks, president; Henry Kennett, secretary; George Mitchell, treasurer.

MILAN, Minn.—A Farmers' Telephone Company has been organized here, with the following officers: H. L. Dalen, president; H. A. Sorenson, vice-president; A. O. Christenson, secretary; T. H. Johnson, treasurer.

PLANO, Ky.—The Plano Telephone Company, of Warren county, has been incorporated with a capital stock of $420, by M. C. Potter, J. D. Wright, of Plano; W. H. Jenkins and J. F. Hagerman, of Bowling Green.

EFFINGTON, S. D.—The Effington Telephone Company has been incorporated, with a capital stock of $5,000. Officers: Thomas Koep, president; John Hardekopf, vice-president; George J. Kramer, secretary and treasurer.

MIDDLETOWN, Ohio.—The Middletown Telephone Company has been incorporated, with a capital stock of $10,000, by Allen Andrews, W. S. Harlan, of Hamilton, and Drs. D. Bundy and L. T. Palmer, of Middletown.

FARGO, Okla.—The Blue Ridge Telephone Company has been incorporated, with a capital stock of $1,000, by J. J. Johnson, G. E. Cashman, J. E. Hutchinson, W. H. Morgan, Will Stephens, S. A. Hall and Louis Zahn.

ELYRIA, Ohio.—The Lorain County Home Telephone Company has been incorporated, with a capital stock of $750,000, by W. E. Brooks, Theodore M. Brush, S. B. Rawson, Edgar F. Allen and Edward M. Brush.

PULLMAN, Mich.—The Pullman Telephone Company, incorporated three years ago by John Pollard, Martin E. Crow and M. A. Olds, to operate an exchange at Pullman, has been sold to a company of farmers for $3,000.

BUTLERVILLE, Ind.—The Farmers' Mutual Telephone Company has been organized in this vicinity and the following officers have been elected: E. H. Smith, president; Jesse Spurling, treasurer; Thomas Sharp, secretary.

WEST LEYDEN, N. Y.—The farmers between this place and Ava have organized a telephone company, to be known as the North Ava Telephone Company. Fred P. Grubel, president; Frank E. Wolfe, secretary and treasurer.

LEWIS, N. D.—The Lewis Mutual Telephone Company has been organized, with the following officers: Wm. Armor, president; F. E. Tennant, vice-president; Wm. E. Shortrige, secretary; M. C. Bromaghin, treasurer.

LONE TREE, Ia.—The East Fremont Telephone Company has been incorporated, with a capital stock of $5,000 and the following officers: J. W. Carey, president; W. J. Kirkpatrick, secretary; F. H. Lentz, treasurer.

GRAYFORD, Ind.—The Grayford and San Jacinto Telephone Company of Jennings county has been incorporated, with a capital stock of $3,000, by A. E. Grimes, D. H. Ziegler, Joseph Rogers, Charles Heaton and O. M. Anderson.

STARRUCCA, Pa.—The Starrucca Rural Telephone Company has been incorporated, with a capital stock of $4,500, by William H. Travis, Hale Eddy, New York; George F. Brooker and A. W. Larrabee, Starucca, Pa., and others.

READLYN, Ia.—The Readlyn Telephone Company has been incorporated by the following: William Schanewise, Henry Schutte, Fred Diekman, Fred Schoof, H. H. Meyer, Henry Westendorf, Carl Bruns and J. J. Schumacher.

VIRGINIA CITY, Mont.—The Centennial Telephone Company has been incorporated, with a capital stock of $20,000. Officers: Robert T. Boatman, president; A. C. Wakefield, vice-president; Pearl I. Smith, Virginia City, secretary and treasurer.

APPOMATTOX COURTHOUSE, Va.—The Appomattox Telephone Company has been incorporated, with a capital stock of $15,000, by the following: George T. Peers, president; John A. Sears, vice-president; B. F. Odin, secretary and treasurer.

CUNNINGHAM, Ky.—The East Cunningham Telephone Company has been incorporated, with a capital stock of $1,050, by D. B. Elsey, W. J. Beard and T. W. Burrow. The company will build a telephone line from Cunningham to Bardwell.

JERUSALEM, Ohio.—The farmers near this town have organized the Jerusalem Telephone Company, with the following officers: C. H. Frederick, president; I. B. Carleton, vice-president; B. F. Cureton, secretary; W. W. Mellott, treasurer.

SOUTHWEST HARBOR, Hancock County, Me.—The Island Telephone Company has been incorporated, with a capital stock of $10,000, with the following officers: Guy H. Parker, president; T. S. Tapley, vice-president; William J. Tower, treasurer.

EDMOND, Okla.—The Deer Creek Valley Telephone Company has been incorporated, with a capital stock of $10,000, by John C. McCain, Solomon P. Starr and A. P. Leonard, of Piedmont, and Charles Dickerson and Charles C. Stoner, of Edmond.

ELKPORT, Ia.—The Volga Valley Telephone Company has been incorporated, with a capital stock of $1,800, and the following officers were chosen: John Osborne, president; Mike Costigan, vice-president; Emil Maier, secretary and treasurer.

CURLEW, Ia.—The Laurens-Curlew Telephone Company has been incorporated, with a capital stock of $5,000, and the following officers elected: H. P. Johnson, president; J. W. Johnson, vice-president; H. H. Sample, secretary and treasurer.

WILKESBARRE, Pa.—The Conynham Valley Telephone Company has been incorporated to run a line from East Butler to Sheppton; capital, $20,000. Incorporators: H. H. Swainbank, L. A. Dymond, Wilkesbarre; A. T. Dymond, Huntington Mills.

GILBERTSVILLE, N. Y.—The Gilbertsville and Wellsbridge Farmers' Telephone Company has been incorporated, and the following officers elected: President, Clifford Wilber; vice-president, John Stark; secretary and treasurer, Charles Ellis.

GENEVA, Neb.—The farmers in this vicinity have organized a telephone company and elected the following officers: J. M. Ward, president, Fairmont; H. R. Deming, vice-president, Geneva; J. H. Morgan, secretary, Geneva; Mark Butler, treasurer, Geneva.

BINGER, Okla.—The White Bread Telephone Company has been incorporated, with a capital stock of $600, by C. T. McSparrin, of Cox; O. E. Bare, H. L. Poteet, both of Gracemont; M. V. Stewart, C. S. Daugherty and D. C. Costello, of Binger.

TUCSON, Ariz.—The Southern Telephone-Electric Company has been incorporated, with a capital stock of $10,000,000, by E. L. Swaine, Ernest A. Olds, H. L. Edwards, F. J. Norris, J. N. O. Rech, Edgar Sharp, N. F. Wilson, Frank A. Weitzel, W. E. Hutchinson.

DARRTOWN, Ohio.—The Darrtown Telephone Company has been reorganized and will improve its exchange in every way. The following officers were elected: W. Gilbert Thompson, president; L. A. Miller, treasurer and general manager; John F. Mee, secretary.

WAYNESBURG, Pa.—The Greene County Telephone & Telegraph Company has been incorporated, with a capital stock of $50,000, by J. N. Scott, W. A. Scott, Jefferson township; George Luse, Eli G. Bailey, Carmichaels; G. S. Waynhoff; T. B. Lee, Pittsburg.

RICKETS, Ia.—The Crawford County Farmers Mutual Telephone Company has been incorporated, with a capital stock of $10,000. The officers are as follows: C. Wendt, president; Herman Fester, vice-president; J. C. Jacobson, treasurer, and August Meyer, secretary.

SHERWOOD, N. D.—The Farmers' Pioneer Telephone Company has been incorporated here, with a capital stock of $25,000, by E. M. Olson, W. S. Teters, F. J. Meekma, J. H. McFarland, Alex Schousby and S. Fuller, all of Sherwood, and Peter Schiffman, of Pleasant.

BOTTINEAU, N. D.—The Loop Mutual Telephone Company has been incorporated, with a capital stock of $8,000, by Walter Munshull, Antler; R. F. Felton, Antler; Robert A. Johnson, Haase; A. A. Lane, Sherwood; G. A. Esval, Sherwood; F. F. Bjornson and Frank Baska, Sherwood.

NAPOLEON, Ohio.—The Henry County Mutual Telephone Company has been incorporated by Henry F. Robes, David Harmon, J. F. Brown, Amos Black and others. The company will erect telephone lines connecting Napoleon with Toledo, Wauseon, Bryan, Defiance, Findlay and Bowling Green.

FUGATES HILL, Va.—The Russell-Mendota Telephone Company has been incorporated, with a capital stock of $1,000, and the following officers elected: J. C. Pruner, president, Mendota, Va.; N. C. Fugate, vice-president, Castlewood, Va.; O. J. Bevins, secretary; John B. Baker, treasurer.

MASON CITY, Ill.—The Mason City Telephone Company, recently incorporated with a capital stock of $5,000, is progressing rapidly with its construction work. The company is officered as follows: Dr. C. A. Stone, president; H. F. Reason, vice-president; J. F. Culp, secretary; W. A. Grady, treasurer.

LONDON, Ind.—The London Telephone Company has been organized, with a capital stock of $5,000, and the following officers: Harry Harrell, president; Dr. O. H. McDonald, secretary; Frank Weaver, treasurer. The plant which has been in operation was owned by John Scott, who sold it to the new company.

TOPSHAM, Vt.—The Topsham Telephone Company has been incorporated, with a capital stock of $5,400, to operate in the towns of Topsham, Corinth, Newbury, Bradford, Orange, Groton and Ryegate. The present stockholders are: O. P. Dickey, East Corinth; J. P. Dickerman and E. Morrison, Groton; E. M. Hood, Topsham, and George W. Merritt, Groton.

SILVER CITY, N. Mex.—The Silver City, El Paso & Southwestern Telephone Company has been incorporated and will at once commence the construction of lines which will connect Silver City with El Paso and a large number of the leading towns of southwestern New Mexico. Incorporators: J. H. Morgan, El Paso; C. B. W. D. Murray, Central; William Bosworth, Deming; Clyde Smith, Silver City; W. E. Baker, Las Cruces.

ELECTION OF OFFICERS.

SCHLESWIG, Iowa.—The Schleswig Telephone Company has elected the following officers: Fred Jepson, president; B. S. Anderson, secretary.

DILLER, Neb.—At the annual meeting of the Diller Telephone Company the old directors were re-elected and a dividend of fifteen per cent was declared.

YAMPA, Colo.—The Elk Mountain Telephone Company has elected the following officers: Fred S. Follett, president; Burt L. Allin, general manager.

YELLEVILLE, Ark.—The Yellville Telephone Company has elected the following officers for the ensuing year: W. R. Jones, president; L. Weast, secretary and treasurer.

LAUREL HILL, Iowa.—The Sweetland Annex Telephone Company has elected the following officers: Patrick Carroll, president; Neal Connell, secretary; Frank Delaney, treasurer.

CAMDEN, Ind.—The Carroll County Co-operative Telephone Company has elected the following officers for the ensuing year: John Kerlin, president; U. E. Tesh, secretary and treasurer.

FOND DU LAC, Wis.—The Woodhull Telephone Company has elected the following officers: O. S. Fenner, president; R. Porter, vice-president; M. B. Stratz, secretary; Frank Schaefer, treasurer.

PARMA, Mich.—The North Parma Telephone Company has re-elected its old officers, as follows: E. F. Borner, president; J. R. Fisk, vice-president; Charles Cochrun, secretary; G. W. Wheller, treasurer.

TOWNSEND, Ohio.—The Townsend Telephone Company has elected the following directors for the ensuing year: E. C. Hull, Elias Jarrett, Dr. W. H. Johnston, Geo. N. Helling and John T. Liles.

PARMA, Idaho.—The Parma Telephone Company has elected the following officers: E. M. Kirkpatrick, president; W. P. Mitchell, vice-president; directors, C. E. Paine, E. H. Brumback, Z. S. Barnum.

SLEEPY EYE, Minn.—The Sleepy Eye Rural Telephone Company has elected the following officers: I. M. Olson, president; C. P. Cutting, vice-president; Wm. Brust, secretary; F. J. Riedl, treasurer.

MURPHY, Iowa.—The Murphy Mutual Telephone Association elected the following officers at its recent annual meeting: Geo. W. Shelly, president; J. N. Livingston, treasurer; J. W. Murphy, secretary.

BELVIDERE, Ill.—The stockholders of the Belvidere Telephone Company have elected the following board of directors: J. R. Balliet, W. M. Marean, F. S. Rowan, George Grummon and M. C. Marean.

UNIONVILLE, Mo.—The Putnam County Telephone Company has elected the following officers: J. N. Comstock, president; H. L. Holman, vice-president; G. E. McCutcheon, secretary; L. P. Roberts, treasurer.

BROOKFIELD, N. Y.—At the annual meeting of the Brookfield Telephone Company the following officers were elected: C. C. Crane, president; A. D. Chesbro, vice-president; N. A. Crumb, secretary and treasurer.

COVER, Minn.—The telephone company here has elected the following officers: E. B. Mayo, of Isle, president; N. B. Berg, vice-president; Mr. Mann, of Midland, secretary and general manager; Adolph Olson, treasurer.

SULLIVAN, Ill.—The Sullivan Telephone Exchange has elected the following officers for the ensuing year: P. J. Patterson, president; E. J. Miller, vice-president; J. W. Patterson, secretary; J. A. Steele, treasurer.

SULLIVAN, Ill.—The Mutual Telephone Company has perfected its organization and elected the following officers: J. C. Hoke, president; Wm. Sherburn, vice-president; J. F. Fleming, secretary; Irving Shuman, treasurer.

PIASA, Ill.—The Piasa Mutual Telephone Company has elected the following officers for the ensuing year: G. R. Waggoner, president; George James, vice-president; George H. Clark, secretary; A. M. Stratton, treasurer.

NASHVILLE, Tenn.—The organization of the Home Telephone Company has been effected and the following officers elected: R. E. Cooper, president; W. C. Polk, vice-president; H. M. Perry, treasurer; Charles Curry, secretary.

NEW BEDFORD, Ohio.—The New Bedford Telephone Company has elected the following directors: J. A. Brown, J. W. Gealey and E. A. Tobey, for two years. W. W. Brownlee, president, and E. A. Tobey, secretary.

ROCHESTER, N. Y.—The Independent Telephone Securities Company, at its annual meeting, elected the following officers: Geo. R. Fuller, president; E. W. Peck, vice-president; Roy C. McCanne, secretary; Fred W. Zoller, treasurer.

TIEEIN, Ohio.—The Farmers' Mutual Telephone Company has elected the following officers: E. T. Umstead, Tiffin, president; O. R. Crum, Bascom, vice-president; Ira Edwards, secretary, Fort Seneca; George Briney, Kansas, treasurer.

UNIONVILLE, Mo.—The Putman County Telephone Company has chosen the following directors: E. N. Monroe, H. L. Holman, J. N. Comstock, S. H. Jackson, Thos. Stout, L. P. Roberts, J. H. Holman, G. C. Miller, G. E. McCutcheon.

JACKSON, Minn.—The Jackson Telephone Company, at its recent annual meeting, declared a 6 per cent dividend and elected the following officers: T. H. Stall, president; Noah Ramey, vice-president; Asher O. Nasby, secretary and treasurer.

COMPTON, Cal.—At the annual meeting of the Compton Home Telephone Company the following officers were elected: W. L. Frew, president; A. W. Miller, vice-president; A. J. Shepard, secretary; W. G. Legg, treasurer; C. Wood, manager.

MT. STERLING, Ill.—The Mt. Sterling Telephone Company has elected the following officers for the ensuing year: Theodore Hagel, president; John H. Briggs, vice-president; Homer C. Vandeventer, treasurer; Edward E. Clark, secretary.

MILWAUKEE, Wis.—The Milwaukee Independent Telephone Company has elected the following officers: H. D. Critchfield, president; E. A. Wadhams and J. S. Van Norwivk, vice-presidents; C. J. Chapin, secretary; Howard Greene, treasurer.

WILLIAMSON, N. Y.—The Wayne-Monroe Telephone Company has elected the following officers: George F. Waters, president; Ledyard S. Cuyler, vice-president; general manager, John A. Driscoll; Judson L. Transue, secretary and treasurer.

AMSTERDAM, N. Y.—The Amsterdam Automatic Telephone Company, at its last annual meeting, re-elected all old officers, as follows: Willis Wendell, president; W. B. Charles, vice-president; George McCumpha, treasurer; Burton Fisher, secretary.

CARLINVILLE, Ill.—At the annual meeting of the Carlinville Telephone Company the following officers were elected: G. R. Waggoner, president; George James, vice-president; Geo. H. Clark, secretary; Abner Stratton, treasurer; Edward A. Forwood, manager.

RED OAK, Iowa.—The Montgomery County Telephone Company has elected the following officers: H. E. Deemer, president, Red Oak; H. M. Havner, vice-president, Marengo; H. S. Rogers, treasurer, Red Oak; F. M. Chandler, secretary and manager, Red Oak.

DETROIT, Mich.—The Detroit Home Telephone Company has elected the following directors: Henry Koehler, Hugo A. Koehler, Max Koehler, Arthur W. Lambert, C. Marquard Forester, Henry C. Stifel, Samuel B. Jeffrey, J. J. Goodyear and Albert N. Edwards.

LA PORTE, Ind.—The La Porte Telephone Company has re-elected its old officers, as follows: J. Vene Dorland, president; A. J. Stahl, vice-president; R. O. Dorland, secretary and treasurer. The annual report shows that the company has had a very prosperous year.

LAWN RIDGE, Ill.—The Lawn Ridge Telephone Company, at its annual meeting, re-elected the old officers, as follows: Chas. Timmons, president; F. H. Cornell, secretary and treasurer; E. P. Phillips, manager. The annual report shows that the company is very prosperous.

ST. CROIX FALLS, Wis.—At the annual meeting of the St. Croix Mutual Telephone Company the following officers were elected for the ensuing year and increased its capital stock to $6,000: Wm. Flemming, president; L. T. Fournier, vice-president; J. V. Carter, secretary-treasurer.

MIDDLETOWN SPRINGS, Vt.—The Rutland County Telephone Company, at its recent annual meeting, elected the following officers: A. W. Foote, Middlebury, president and general manager; W. E. Grover, Middletown Springs, vice-president; D. S. Carpenter, secretary, Middletown Springs.

BRENHAM, Texas.—At the annual meeting of the Brenham & Shelby Telephone Company the following officers were elected: Dr. E. R. Koolle, president; Joseph Mikesha, secretary and treasurer; Hon. T. A. Low, vice-president. The company will make extensions and improvements in the near future.

PRINCETON, Ill.—At the recent annual meeting of the Bureau County Telephone Company all the old officers were re-elected, as follows: Dr. E. A. Owen, president; Aaron Dunbar, vice-president; S. S. Harris, secretary; A. H. Ferris, treasurer; C. O. White, manager. The annual report shows the company to be in a very prosperosu condition.

OMAHA, Neb.—At a meeting of the stockholders of the Independent Telephone Company of Omaha, the same officers were re-elected, as follows: U. S. Grant, Jr., of San Diego, president; F. H. Stow, vice-president; F. S. Graves, secretary; C. E. Bittinger, treasurer. The company has filed a mortgage to secure the issue of $3,300,000 bonds recently authorized by the corporation.

FRANCHISES AND TRANSFERS.

FULTON, Ky.—J. D. Kennady has purchased a rural telephone franchise here.

FULDA, Minn.—The Fulda Telephone Company has purchased the Heron Lake local exchange.

SCOTTSVILLE, Va.—The Albemarle Telephone Company has applied for a franchise in this town.

MIDDLETON, Ohio.—The Hamilton Home Telephone Company has made application for a franchise in this town.

CLEVES, Ohio.—The Fitzsimmons Independent Telephone Company has made application for a franchise in this town.

CINCINNATI, Ohio.—The Citizens Telephone Company has purchased a franchise at Williamstown, Ky., for $15,000.

LA PORTE CITY, Ia.—The La Porte City Farmers' Mutual Telephone Company has been granted a franchise in this town.

OAKDALE, Wash.—J. E. Tramill has bought the rural telephone system at this place and expects to improve and extend it.

KILBOURNE, Ill.—C. G. Close, owner of the Kilbourne Telephone exchange, has sold the same to Miss Alice Pratt of this place.

HURON, S. D.—The Dakota Central Telephone Company has presented an application for a franchise to the city council here.

WABUSKA, Nev.—J. M. Benham and H. Hironymous have applied for a franchise to run a telephone line from this place to Yerington.

DONORA, Pa.—The Roscoe Telephone Company has been granted a charter to operate an exchange at this place. Capital stock, $5,000.

ELLSWORTH, Kas.—The Ellsworth Co-operative Telephone Company has been granted a twenty-year franchise to operate a system at this place.

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GALLATIN, Tenn.—The Home Telephone Company has been granted a franchise for operation in Gallatin, and the poles are now being placed.

WEST POINT, Iowa.—H. D. Everingham has sold his telephone line, running from West Point to Fort Madison, to the Mississippi Valley Telephone Company.

MIDDLETOWN, Ohio.—Attorney Walter S. Harlan and others have asked the city council for a franchise to build and operate an Independent telephone system in this town.

ELKIN, W. Va.—The Citizens' United Telephone Company will make application for a franchise to build and maintain telephone lines over the roads of Randolph county.

SAN ANGELO, Tex.—The San Angelo Telephone Company has purchased from Dr. Bascom Lynn and N. B. Weaver the Bronte-Sweetwater lines for a consideration of $9,500.

GRISWOLD, Iowa.—The Farmers' Mutual Telephone Company was recently granted a franchise and has bought the Musson Brothers' exchange in Griswold and three county lines.

SILVER CREEK, Neb.—A half interest of the Silver Creek Telephone Company has been purchased by Geo. Vremeen, who will become personally responsible in the enterprise.

GENEVA, Neb.—The Telephone Users Association has been merged with the Farmers Independent Company, which company has a capital stock of $100,000. J. M. Ward, president.

OWENTON, Ky.—The Owenton and Williamstown Telephone and Telegraph Company has sold its property to the Citizens' Telephone Company, of Cincinnati, for a consideration of $15,000.

VICKSBURG, Miss.—N. D. Smith and S. A. Jones, representing the Home Telephone Company, have filed their application for a franchise granting them rights to build a plant in this city.

BREAUX BRIDGE, La.—The Breau Bridge-St. Martin Telephone Company has secured a twenty-five year franchise from the town council and has started its new line, which will give connection with adjoining towns.

YORK, Pa.—A charter has been granted to the York Telephone and Telegraph Company, a corporation which has absorbed the York Telephone Company. Capital stock, $500,000. Directors: D. F. Lafean, G. B. Rudy and William S. Eisenhart.

TALIHINA, I. T.—M. C. Morris and associates have made application to the city council for a telephone franchise here. If the franchise is granted, they expect to have the exchange up and in working order within ninety days after the granting.

ST. HILAIRE, Minn.—G. W. Hooper, of Crookston, has been granted a franchise to operate and maintain a telephone system in this town. He has made a deposit as an evidence of good faith and expects to have the system in working order by August 1st.

BLACKBURN, Okla.—C. G. Mason has bought the entire system in this town, and expects to rebuild and connect with as many of the farmers in the vicinity as possible in the next year, and hopes to increase the exchange from 100 to 150 telephones in that time.

GRAND RAPIDS, Mich.—The Lansing council has granted the amended franchise for the Citizens' Telephone Company in that city and the work of improvement will be taken up soon, the company planning to expend $125,000 for a new exchange building and other improvements.

BEDFORD, Pa.—All of the stock of the Bedford County Telephone Company has been transferred to F. D. Houck of the American Union Telephone Company. Extensive improvements will be made, among which will be a long distance service between Philadelphia and Pittsburg.

DES MOINES, Ia.—The Mutual Telephone Company has absorbed all of the Independent lines in and around Des Moines, including the Jasper county, Boone county, Iowa Southern and Hawkeye telephone companies. The capital stock of the Mutual company has been increased from $160,000 to $450,000.

NEW WILMINGTON, Pa.—The entire capital stock of the New Wilmington Telephone Company has been purchased by Robert J. Totten, of New Wilmington, who is a director of the Palingrove Independent Telephone Company, which will be united by one or two pairs of wires from Volant to New Wilmington.

GREENBRIER, W. Va.—Dr. M. A. Gates has sold all of the rights, franchises and property of the Greenbrier and Organ Cave Telephone Company to Messrs. H. L. Van Sickler, John Laing, James Laing, R. L. Telford, K. M. Snyder, R. M. Bell, Wm. Bell and E. L. Bell, all of Lewisburg. The new company, it is said, will not only maintain the service hitherto given, but will increase its efficiency.

JEFFERSON, Ia.—Wm. and Harry Jenison have bought the controlling interest of the Greene County Telephone Company's stock, and have taken up the personal direction of the service department. The company is officered as follows: Mahlon Head, president; D. E. Brown, first vice-president; B. F. Osborn, second vice-president; Harry Jenison, secretary; M. M. Head, treasurer; Wm. Jenison, general superintendent.

CLAY CENTER, Kas.—A deal has been consummated whereby a stock company, composed of Clay Center business men, bought out the Clay Center Telephone Company and assumed charge of the plant. The consideration was $30,000. It is understood that the company will be incorporated for $40,000. The directors of the new company are P. F. Trice, H. O. Axtell, P. M. Conrad, L. Kreek, W. H. Fletcher, William Docking and G. M. Stratton.

SAN ANGELO, Tex.—The telephone line from Bronte to Sweetwater and local exchanges at Fort Chadbourne, Bronte and James, have been sold by Dr. Bascom Lynn of this city and N. K. Weaver of Sweetwater to the San Angelo Telephone Company for a cash consideration of $9,500. Messrs. Jerry and Jack Rust are the owners of the San Angelo Telephone exchange and rural lines, and with the addition of the new purchase have an extensive system in this section of the state.

PLYMOUTH, N. H.—The White Mountain Telephone and Telegraph Company has been chartered, with a capital stock of $100,000. The company has absorbed the Plymouth & Campton telephone exchange, the Franconia Telephone Company, the exchange of the New England Telephone Company at Woodsville, also at Bradford, Vt. The officers of the new company are: Allen Hollis, of Concord, president; Davis B. Keniston, of Plymouth, treasurer; Walter I. Lee, general manager.

SHERMAN, Texas.—The North Texas Telephone Company, with headquarters in this city, has purchased the property known as the Phoenix Telephone and Telegraph Company, which consists of a toll line between Sherman and Honey Grove, with exchanges at Honey Grove and Bonham. C. A. Shock, of Sherman, secretary and treasurer of the North Texas Telephone Company, says it is the intention of the new owners to put the property in first-class condition for the transmission of long distance messages. New copper circuits will be added throughout the entire length of the line.

NEW CONSTRUCTION AND EXTENSION.

AVON, Ill.—The Avon Mutual Telephone Company will rebuild its local system.

ADA, Ohio.—The Ada Telephone Company is erecting a new exchange building.

CLEARWATER, Minn.—The Clearwater Telephone Company will extend its lines to Fair Haven.

HASTINGS, Mich.—The Citizens' Telephone Company will expend about $6,500 in underground work.

SILVER CITY, N. M.—The Grant County Telephone Company will install another new switchboard.

ORR, I. T.—The Merchants and Planters Telephone Company is building a line from Orr to Marietta.

AURORA, Minn.—The Mesaba Telephone Company has just established an exchange in this town.

WAMEGO, Kas.—The Wamego Telephone Company is making extensive improvements in its system.

GAYLORD, Mich.—The Otsego County Telephone Company will extend its lines from this place to Frederic.

THAYER, Kas.—The Thayer Telephone Company is planning to build a trunk line from here to Earlton.

WHEELING, W. Va.—The National Telephone Company is extending its lines from Sherman to Cameron.

DAMASCUS, Ohio.—The Damascus Telephone Company will soon make extensive improvements in its system.

LANSING, Mich.—The Home Telephone Company will start at once the erection of a $100,000 office building.

MADELIA, Minn.—The Madelia Telephone Company will begin the construction of a new rural line at once.

SPOKANE, Wash.—The Interstate Telephone Company is extending its line to East Greenacres and Sucker Lake.

MESABA, Minn.—The Mesaba Telephone Company is planning to build a line between Virginia and Biwabik.

ROCKWELL CITY, Ia.—The Central Mutual Telephone Company is erecting a $10,000 exchange building here.

WASHBURN, Mo.—The Washburn Prairie Telephone Company will construct a line from this place to Cassville.

LAPORTE, Ind.—The Laporte Telephone Company is putting in exchanges at Rolling Prairie and Union Mills.

TREYNOR, Ia.—W. J. Way is building an exchange here and extending telephone lines into the surrounding country.

SPOKANE, Wash.—The Home Telephone Company will soon begin construction on its new $60,000 exchange building.

BOUGHTONVILLE, Ohio.—The Boughtonville Telephone Company is putting in toll lines from this place to Greenwich.

KEOKUK, Ia.—The Mississippi Valley Telephone Company will erect another exchange building, in Keokuk, at a cost of $7,800.

GROVE CITY, Minn.—The Grove City & Rosendale Telephone Company is planning many extensions to its lines this summer.

TERRY, Mont.—The Terry Telephone Company will increase its capital stock and extend its lines to Knowlton and other points.

ADMIRE, Kas.—The Admire Telephone Association will build a line to Harveyville, connecting that town with Eskrige, Keene, Paxico and Burlingame.

BAY CITY, Mich.—The Northeastern Telegraph & Telephone Company, whose lines extend from Bay City to Alpena, is putting up two more wires north of the city.

ST. PAUL, Minn.—The Tri-State Telephone Company will install a new branch exchange at 881 Payne avenue, which building it has purchased for $17,000.

PAXTON, Ill.—The Paxton Telephone & Telegraph Company is planning additions and improvements which will more than double the capacity of the plant.

WILDOMAR, Calif.—The Home Telephone Company will establish an exchange at this place and build lines connecting with Elsinore and other points in its system.

STET, Mo.—The Stet-Rockingham-Norborne Telephone Company, at its annual meeting decided to erect a new exchange building, at an estimated cost of $3,000.

PANA, Ill.—The Christian County Telephone Company is making arrangements to rebuild its Morrisonville exchange and will make other improvements and extensions.

LEBANON, Ind.—The Lebanon Telephone Company will erect and equip a new exchange in this city, and will change the magneto system to that of a full common battery system.

COUNCIL BLUFFS, Ia.—At a meeting of the directors of the Independent Telephone Company a resolution was adopted calling for the expenditure of $42,000 for new construction this year.

IMPERIAL, Cal.—The Imperial Telephone Company is preparing to make extensive improvements throughout Imperial Valley. New exchanges will be put in at Brawley, Calexico and El Centro.

SANDUSKY, Mich.—The Sandusky Telephone Company is at work on a toll line to Marlette. During the summer the company expects to complete several other lines running out from this city.

ARTESIA, N. M.—Lines have been built by the Penasco Telephone Company to Cloudcroft, which gives it connections with El Paso, Alamogordo and other points along the Rock Island road.

OMAHA, Neb.—The Omaha Independent Telephone Company, which was granted a franchise last fall, has purchased the ground for the site of its new central exchange. The new building will cost $60,000.

NEW CASTLE, Pa.—The Citizens' Telephone Company contemplates expending $250,000 in improvements during the coming summer. Of this amount $50,000 will go for a switchboard of the most modern type.

AUBURN, Neb.—At a meeting of the directors of the Auburn Telephone Company it was decided to make extensive improvements in the next six months, among which will be the erection of a new exchange building.

BEAUMONT, Tex.—The city council has granted the Beaumont Telephone Company permission to locate and maintain a public telephone booth on the order of the slot machine on the street in the vicinity of the postoffice.

PERU, Ind.—The Peru Telephone Company will soon establish connections with Indianapolis. Pay stations will be installed at Miami and

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Bennet's Switch, and thousands of dollars worth of new cable put up in the city of Peru.

FULTON, N. Y.—The Oswego County Telephone Company is at work on its lines running from Fulton to Hannibal and hopes to connect there with the wires of the Wayne-Monroe Company. The company is also preparing to enter Oswego.

TUCSON, Ariz.—The consolidated Telephone, Telegraph & Electric Company has about completed an extension connecting Willcox, Russelville, Dragoon Summit and Cochive with its system. Several other extensive improvements are being planned.

SAN FRANCISCO, Cal.—The Home Telephone Company has bought a site for administrative offices and a central exchange on the corner of Grant avenue and Harlan place. A six-story building will be erected, at an estimated cost of a million dollars.

GREAT FALLS, Mont.—The Independent Telephone Company of Montana, T. S. Lane, general manager, is contemplating the installation of a system in this city. Mr. Lane has made the statement that his company expects to have the exchange in operation before the first of the year. Underground work will be commenced shortly.

FINANCIAL.

LOWES, Ky.—The Lowes Telephone Company has increased its capital stock from $1,000 to $2,000.

MINIER, Ill.—The Minier Mutual Telephone Company has increased its capital stock to $38,000.

PAYNE, Ohio.—The Payne Telephone Company has increased its capital stock from $15,000 to $25,000.

BERLIN, Ohio.—The Berlin Telephone Company has increased its capital stock from $4,050 to $25,000.

EMPIRE, Wis.—The Empire Telephone Company has increased its capital stock from $1,800 to $4,000.

MEDINA, Ohio.—The Medina Telephone Company has increased its capital stock from $30,000 to $44,500.

NORWICH, N. D.—The Norwich Telephone Company has increased its capital stock from $5,000 to $25,000.

SARDINIA, Ohio.—The People's Telephone Company has increased its capital stock from $5,000 to $15,000.

BANGOR, Wis.—The Bangor Telephone Company has increased its capital stock from $5,000 to $25,000.

BEREA, Ohio.—The Citizens' Telephone Company has increased its capital stock from $50,000 to $65,000.

VANDALIA, Ill.—The Vandalia Telephone Company has increased its capital stock from $6,000 to $15,000.

TOBINSPORT, Ind.—The Tobinsport Telephone Company has increased its capital stock from $1,000 to $1,500.

WALBURG, Tex.—The Walburg-Weir Telephone Company has increased its capital stock from $4,000 to $7,000.

LAPORTE, Ind.—The LaPorte Telephone Company has increased its capital stock from $60,000 to $100,000.

MANKATO, Minn.—The Mankato Telephone Company has increased its capital stock from $100,000 to $150,000.

HELENA, Mont.—The Montana Telephone Company of Chouteau has increased its capital stock from $2,400 to $25,000.

MULBERRY GROVE, Ill.—The Mutual Telephone Company declared a 5 per cent dividend at its recent annual meeting.

CAROLINE, Wis.—The Farmers' Independent Telephone Company has increased its capital stock from $2,500 to $10,000.

GRATIOT, Ohio.—The Gratiot and Brownsville Telephone Company has increased its capital stock from $25,000 to $30,000.

FINDLAY, Ohio.—The Findlay Home Telephone Company has increased its capital stock from $150,000 to $200,000.

ATHENS, Wis.—The Athens Telephone Company has filed an amendment increasing its capital stock from $750 to $6,000.

EARL, Ark.—The Earl & Tyronza Telephone & Telegraph Company has increased its capital stock from $5,000 to $10,000.

POLO, Ill.—At a special meeting of the Polo Mutual Telephone Company the capital stock was increased from $5,000 to $10,000.

CHENANGO FORKS, N. Y.—The Chenango Valley Telephone Company has decided to increase its capital stock from $7,000 to $10,000.

MINNEAPOLIS, Minn.—The directors of the Tri-State Telephone Company have declared the sixteenth quarterly dividend of 6 per cent.

DUSHORE, Pa.—The Sullivan County Telephone Company has increased its capital stock to $10,000 and will make improvements.

CORINNA, Me.—The West Penobscot Telegraph and Telephone Company has voted to increase its capital stock from $10,000 to $50,000.

OCONOMOWOC, Wis.—The Badger Telephone Company has amended its articles of incorporation, increasing its capital stock from $5,000 to $25,000.

SPARTA, Tenn.—At the annual meeting of the Gainsboro Telephone Company it was decided to increase the capital stock from $240,000 to $500,000.

DAYTON, Ohio.—The stockholders of the Home Telephone Company of Dayton have authorized an increase in the company's capital stock from $1,200,000 to $2,000,000.

CHESTER HILL, Ohio.—The People's Telephone Company has increased its capital stock from $20,000 to $50,000; by C. P. Yocum, president; W. H. Penrose, secretary.

Personal.

W. T. Stromeyer, of Dallas, has accepted the position of general manager of the West Texas Telephone Company's affairs in Brownwood, Texas.

P. E. Baer has resigned as manager for the Texarkana Telephone Company, Texarkana, Texas, to be succeeded by John B. King, who formerly held the position.

Mr. George Schlosser has resigned as manager of the Home Telephone Company, of Gibson City, Ill., and is planning to go west. His successor has not been announced.

O. L. Ingalls has resigned as secretary, treasurer and manager of the Westfield Telephone Company, of Westfield, N. Y., and S. C. Crandall has been elected to fill the position.

Howard Harrison, for the past two years with the Home Telephone Company, of Richmond, Ind., has been appointed superintendent of the College Corner Telephone Company.

Charles Montague has resigned his position as manager of the Home Telephone Company's exchange at River Park, Ind. C. M. Hays, of Noblesville, has been appointed his successor.

C. R. Sargent, who has been manager of the Interurban Telephone Exchange Company at Evansville, Minn., since its organization, has resigned, and will retire from the service of the company.

William Horne, Sr., has been elected president of the Lafayette Telephone Company, Lafayette, Ind., to succeed the late William Folckemer. Dr. E. V. Burt was elected vice-president, to succeed Mr. Horne.

G. S. Terrill, of Jefferson, Iowa, who recently purchased the Fremont telephone exchange from W. E. Jenison, has disposed of the property to Lincoln Sauer, who has taken complete charge of the business.

George Hille, who has for some time been connected with the Fox River Valley Telephone and Telegraph Company, in charge of its contract department, has resigned. He will go to Denver, where he will again take up telephone work.

SOUND WAVES had a couple of distinguished visitors during the past month in Ernest Feyerabend and Friedrich Merk, of Berlin, on a mission from the German government. Mr. Feyerabend is telegraph engineer, which position also includes telephone matters and is connected with the general postoffice department and telegraph and telephone departments, which are controlled by the German government, while Mr. Merk is an engineer connected with Deutsche Waffen und Munitions Fabriken, a company making electrical apparatus and military arms and cartridges. The mission of the visitors is to look into telephone matters of all companies in this country and telegraph operations as well; the government desiring to ascertain what improvements have been or are being made.

Brevities.

W. H. CRUMB & Co. has removed from its former location in the First National Bank to suite 835 Monadnock building.

A. J. Cox & Co., Chicago, has been appointed western sales agent for Legler, Grimes & Eilerman, manufacturers of finished or die-molded castings.

"KIRK'S" blotter for May gives us William J. Lampton's "The World Won't Seem All Wrong." The blotter is issued by the McRoy Clay Works, and has become a regular monthly visitor, identified with the telephone movement.

"HOW THE TELEPHONE HELPS THE FARMER" is the title of a booklet issued by the Stromberg-Carlson Telephone Manufacturing Company, which should be in the hands of every farmer in the United States. The company will be glad to send a copy upon request.

IN a circular letter describing its automatic switch, the Automatic Electric Company says that the machine makes the connection instantaneously; "it has 'fingers' but no ears; it can not 'rubber,' nor tattle, nor flirt, nor gossip; it has all the virtues and more and none of the faults of 'Central.'"

THE Manhattan Electrical Supply Company is distributing its new catalogue number 22. The book contains 124 pages and is profusely illustrated with all things electrical. We believe it is one of the most comprehensive small catalogues published in the telephone and electrical field. Being of pocket size, its convenience will appeal to those having use for it. A copy will be sent upon written request.

L. M. ERICSSON TELEPHONE MANUFACTURING COMPANY has sent to the trade a card circular containing an attached return postal to be used, in order that certain of its catalogues may be designated by those who receive the circular. The company is now ready to supply catalogues describing its common battery wall telephones; common battery desk sets; magneto wall telephones; and magneto desk sets. The circular calls especial attention to two types of receivers.

J. W. JOHNSON, a consulting and contracting engineer of La Crosse, Wisconsin, was showing a new cable grip, at the convention—which seemed to strike construction men as being an improvement over present hangers. The wire is so formed that it would be practically impossible for the elements to remove the hook from the strand. Its simplicity and adaptability will probably be exploited by the Vote-Berger Company.

W. O. RHODE, formerly manager of the branch at Kansas City, Mo., for the Swedish-American Telephone Company, has been appointed to manage the new branch of the Century Telephone Construction Company, which was opened June 1. It is the purpose of the Century Company to carry a full line of its apparatus and supplies in its western house to supply the growing demand for its product in the south and west.

THE Massachusetts Chemical Company has issued a catalogue and price-list of its insulating material, adopting the plan of the loose-leaf method. The cover permits an expansion of about three inches, which would indicate that the company intends to add a great many pages, ninety-one of which are included in the initial edition. Another booklet sent out by the same firm tells you how to insulate an armature or a field coil.

"Trumbull Cheer" is a little magazinette published each month "if it's lucky," in Plainville, Conn., with a hunch for Trumbull material and a fond desire to be cheerful. It makes very little pretension of being the house organ of its promoter, and holds very close to its title by way of contents. We really hope that it will be "lucky" and issue as frequently as once a month. "The Power of Personal Effort" is the title of another little booklet issued by this company which is characteristically unique.

The cedar business of the Pittsburg & Lake Superior Iron Company is now conducted by the National Pole Company, an organization made up largely of the stockholders of the old concern. The new company will aim to continue the policy and principles that have so long prevailed. It will increase its facilities for the conduct of the business by establishing yards on the Pacific Coast with headquarters at Everett, Wash., and also proposes to carry a stock of poles in the eastern states.

W. N. Matthews & Brother have issued a net price list in a number of colors that is so far out of the ordinary that we would recommend our readers to write for it. The Matthews specialties are increasing right along and now include Stombaugh guy anchors in all sizes, Kearney cable clamps, Holdfast lamp guards, Lima jack boxes and plugs, Hargis splicing joints, and Callahan cable rollers. To do outside construction work, it would seem almost necessary that most of these specialties be used.

The Monarch Electric & Wire Company has been manufacturing its weatherproof wire under the Monarch special process since the first of the year. The company announces that it has so improved its product that the largest users of weatherproof wire concede it to be the best available and superior to any in the west. In its manufacture of weatherproof iron wire the company states positively that it uses no fence wire, nor any other inferior grade, and cautions buyers that cheaper goods are the most expensive in the long run.

"Messages to New York" is the title of a clever booklet recently put out by the Automatic Electric Company, which purports to be a packet of telegrams between covers. The pages are genuine Postal telegraph blanks, and the dispatches are facsimile typewriting. Besides being unique as an advertisement, the work is valuable because it gives the expression of men high in the councils of citizens all over the United States, justifying the efficiency of secret service. These dispatches are addressed to the mayor of New York City and were intended to influence a favorable decision regarding the New York franchise.

The Wesco Supply Company, importers and jobbers of electrical machinery and supplies, announce the establishment of a new branch office at Birmingham, Ala. This new office will be in charge of Mr. W. W. Moore, electrical engineer, who for several years has managed the apparatus department of the company, with headquarters at St. Louis. Mr. Moore is a native of the south and a very capable and well posted man in this particular branch of the electrical business and his wide acquaintance and many friends in that section assure the company in advance of an extensive and profitable patronage through its newly established office.

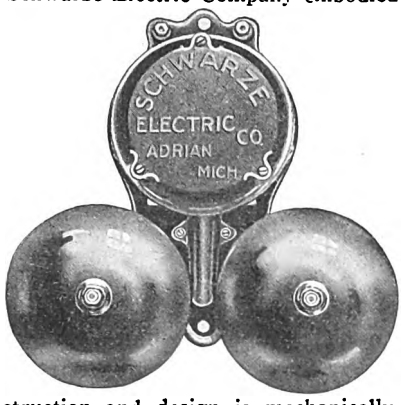
The Sterling Electric Company, Lafayette, Indiana, exhibited nothing at the recent International convention, although its expense must have been enormous. The hotel writing-room was transformed into a luxurious lounging-room for the tired delegates. The hotel parlors was as nothing compared with the Sterling "parlor," with its restful lounges and oriental splendor. The massive palms which secluded an ever-busy orchestra and the cordiality of the attendants made for the popularity of the Sterling exhibit. The decided novelty of this successful "exhibit" will continue as a pleasant memory. For souvenirs, the Sterling gave away the official program done in purple and gold.

The Central Telephone & Electric Company, by means of a very effective series of follow-up letters, has been favored with the following reply which is self-explanatory: "If you have any cameras, lenses, card stock or any photographic chemicals or supplies, please send me a catalogue, but if not, for Heaven's sake, don't send me any more telephone literature, as I have no use for a telephone unless I wish to talk to my girl (which is quite often, however). I have received literature from about 13,000,000 telephone companies, because a traveling man happened to see me putting up an electric bell, and he sent my name all over the country as being in the market for telephones, etc. Of course you could not help it, as you got a 'bum steer,' but "nough sed,' so please oblige."

George R. Blackburn, manufacturer of the well-known Blackburn ground clamp, has received a number of communications asking whether the clamp can be attached to a lead pipe without danger of the screw puncturing it. He desires to inform the trade in general that it is not possible to do this with the improved ground clamp he is now supplying. While it is not considered good practice by many telephone engineers to ground on a lead pipe, conditions sometimes suggest no other accessible means. The Blackburn clamp makes this possible because of a cap which distributes the bearing of the screw point over a large surface, making it impossible to injure the lead. The same device can be used with equal effect upon iron pipes. Samples and prices will be furnished to any one upon request.

The Century Telephone Construction Company is now located in its new factories, 1738 Elmwood avenue, Buffalo, N. Y., where it has in operation one of the largest, most complete and up-to-date plants for the manufacture of telephone apparatus in the country. The growing demand for Century common battery switchboards and telephones and magneto apparatus necessitated these large quarters, and there is every indication that the factory will be running night and day the year round. The Century Company also has a factory in Toronto, Canada, 53-57 Adelaide street west, which takes care of the growing Canadian business. The company has arranged to open a branch house in Kansas City and by June 15th will be in position to ship apparatus and supplies from that point throughout the southwest. The company also contemplates establishing a branch house in Chicago at an early date.

In designing its loud ringing magneto extension bell, the Schwarze Electric Company embodied a combination of essential features to produce a bell of the same high efficiency that has characterized its general line of signal bells. The bell illustrated is weatherproof; its poles are arranged in such manner that the permanent magnet can not be discharged; the spools are sufficiently large to justify the use of No. 35 wire for the maximum number of ampere turns; the wire used is all active and the armature is under the influence of the coils its entire length. The entire construction and design is mechanically and artistically as nearly perfection as modern practice and ingenuity requires. A booklet, entitled "Electric Bells," will be sent free to any applicant.



The Monarch Telephone Manufacturing Company has just established a branch house at 177 Main street, Dallas, Texas, in order to properly handle the volume of business it is receiving from Texas, Oklahoma and the Indian Territory. For the past four years the Monarch Company has been represented in Texas by jobbing houses, which have built up a good business in the apparatus of this well known manufacturing company. Now that the business has reached such proportions that it can not be handled advantageously and economically through the medium of a jobbing house, the Monarch Company has done the one thing which was left open to be done and has established this branch house which will take care of orders, inquiries and correspondence in just as prompt and courteous a manner as such matters are taken care of by the general office in Chicago. The branch house is in charge of Mr. D. C. Lingo, who has spent six years in the telephone business in Texas. Mr. Lingo is well known among the trade in the state and he is a fit representative of the company and one who will carry out the Monarch principles and ideas. Already a large consignment of telephones, switchboards and construction material have been sent to Dallas and orders are now being filled without any delay. It is the aim of the Monarch Company to handle the affairs of this branch house in such a manner that telephone orders, or, in fact, orders for any standard apparatus, will be shipped out the same day as received. To do this a large stock will be carried, but the business warrants it and the Monarch Company intends taking care of the business. That Texas is a good field there is no question, and that Monarch apparatus is popular in this field has already been proven. The success of the branch house is, therefore, practically assured.

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Approved by

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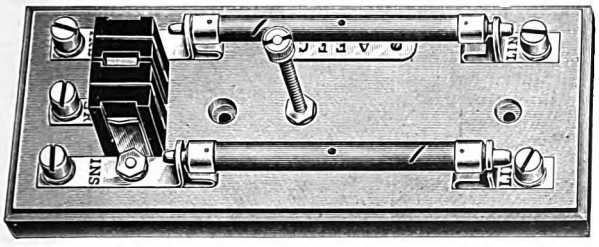
Save Insurance and Avoid Loss and Damage Suits

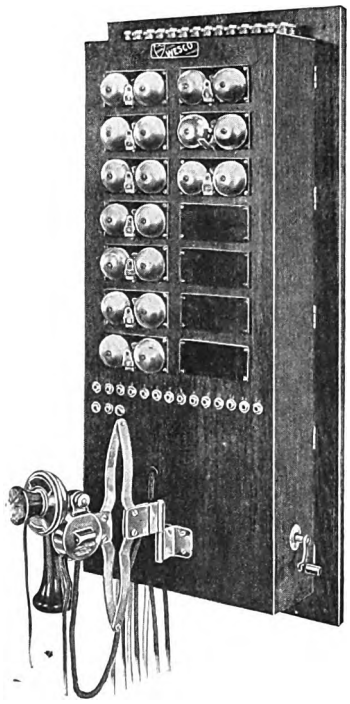


No. 990—Furnished with metal cover

We make Protectors for all Purposes. Send for Catalog and Samples.

American Electric Fuse Co.

NEW YORK MUSKEGON, MICH.



Wesco

Ringer-board

This is the WESCO 14 Line Ringer Board having 10 lines installed and room for 4 additional lines to be added when needed. We make a complete line of high grade telephones and switchboards for all classes of magneto service, and shall be pleased to send you catalogs and bulletins and quote you prices.

THE WESCO SUPPLY CO.

Ft. Worth, Tex.
St. Louis, Mo.

Metal Poles

"Poe's Metal Telephone and Telegraph Poles" are infinitely **better, cheaper, lighter** and **more durable,** than any other pole on the market. These poles are exceedingly rigid, and present an almost negligible surface to wind pressure.

WILL LAST 100 YEARS

W. H. GILL, Selling Agent

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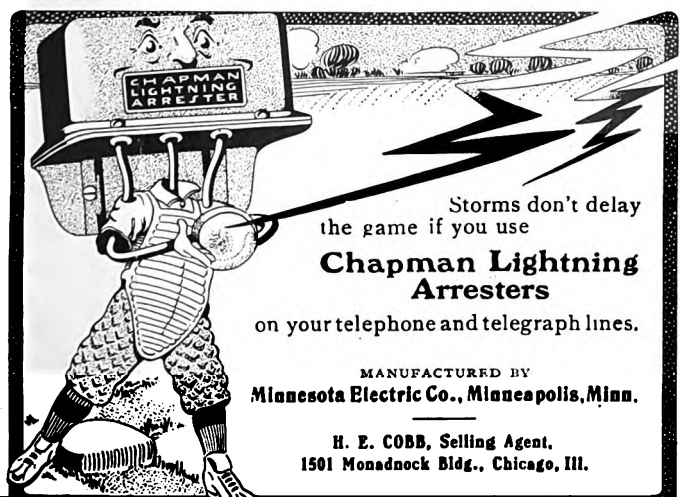


Storms don't delay the game if you use

Chapman Lightning Arresters

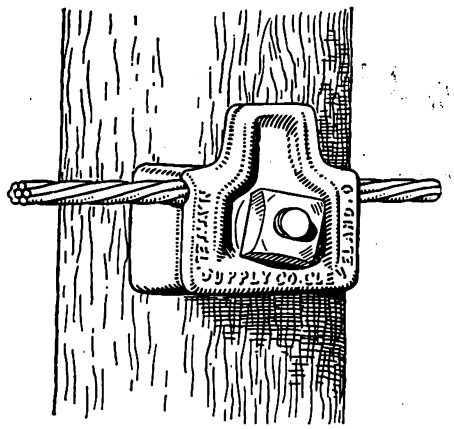
on your telephone and telegraph lines.

MANUFACTURED BY
Minnesota Electric Co., Minneapolis, Minn.

H. E. COBB, Selling Agent,
1501 Monadnock Bldg., Chicago, Ill.

Non-Breakable Messengers

HANGERS



HOT GALVANIZED

No experiment. They have been tried out and are being used to-day in all parts of the United States and Canada.

National Telephone Supply Co.

3921 Superior Avenue, Cleveland

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American Electric Telephone Co., Mfrs., 64TH and STATE STREET, CHICAGO

WE ISSUE THE FOLLOWING BULLETINS AND CATALOGUES

No. 10. American Express Switchboards
No. 11. Desk Toll and Private Branch
No. 12. Visual Signal and Bell Style Switchb'ds
No. 13 Intercommunicating Systems
No. 14. Line Material and Supplies.
No. 15. Bell Express Self-Restoring Switchb'ds
No. 16. Operator's Set and Accessories
No. 17. Parts of Apparatus
No. 18. Magneto Telephones of all kinds
No. 19. Central Energy Switchboards
No. 20. Central Energy Telephones
No. 21. Protective Apparatus and Terminal Equipment
No. 22. Construction of Country Tel phone Lines
No. 23. Eight-Party Selective Ringing Telephones
No. 25. Four-Party "Leich" selective Telephone System
No. 26. Telephone Power and Ringing Equipment

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The Lindsley Brothers Company, PRODUCERS AND SHIPPERS OF

Western Cedar Poles

SPOKANE, WASHINGTON
EASTERN SALES OFFICE: 835-98 JACKSON BOULEVARD
CHICAGO

W. H. CRUMB & COMPANY

Engineers : : Contractors

Telephone Engineering and Construction
Plans, Specifications and Estimates Promptly Furnished
835 Monadnock Bldg., CHICAGO, ILL.

Samuel G. McMeen Kempster B. Miller

McMeen & Miller

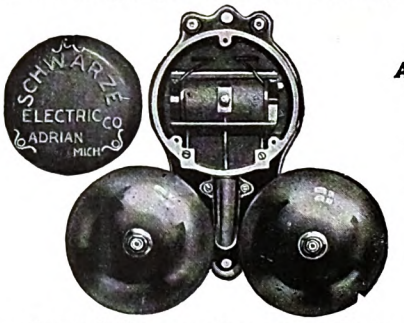
Engineers and Constructors of Telephone Exchanges
Special Reports and Tests

SOLICITORS OF PATENTS

1454 Monadnock Block
CHICAGO

Magneto Loud Ringing Extension Telephone Bells

Size of Gongs
6 in.
7 in.
8 in.
9 in.
10 in.



All Resistances All Weather Proof.

Efficiency, Durability and price will interest you.

SCHWARZE ELECTRIC CO. Main Office and Factory ADRIAN, MICH.

The Improved Anchor of Merit

THE EVERSTICK

Cut shows anchor at bottom of hole, partially expanded, and fully expanded.

¶ The Everstick Anchor expands into the undisturbed earth at the bottom of the hole. There is no backward movement—no vacuum to hold water. They are made of malleable iron and covered with asphaltum. They do not creep. They will not break. They are quickly installed. They are correct in principle.

¶ Write for our descriptive literature explaining why the Everstick is cheaper than other anchors where area of holding surface is considered. Your money's worth or your money back if you are not satisfied.

Manufactured and sold by

The Everstick Anchor Co.

17 SO. MAIN STREET, ST. LOUIS, MO.

Telephone Cords

Premier BB Switchboard Cords
Tinsel Switchboard Cords
Telephone Receiver Cords Transmitter Cords
Desk Stand Cords Yardage Silk Cord

Telephone Wires

Weatherproof Outside Distributing Wires
Single or Duplex
Interior Glazed Braid Wires
Single, Duplex or Triplex
Flameproof Jumper and Plain Rubber Wires
Single, Duplex or Triplex

Switchboard Cable

ALL SIZES COLOR CODED AND BEESWAXED CABLE

Secure Our Prices

HIGH-GRADE GOODS PROMPT SHIPMENTS

Premier Electric Co.

141 So. Clinton St. CHICAGO

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JUL 18 1907

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SOUND WAVES

VOLUME XIV
No. 2

INTERNATIONAL TELEPHONE JOURNAL

JULY
1907

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CHICAGO, JULY, 1907

PUBLICATION OFFICE
1253-4 MONADNOCK BLDG

STANDARD
Underground Cable Co.
322 Rookery, Chicago

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PHILADELPHIA
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BOSTON
NEW YORK
ST. LOUIS
OAKLAND, CAL.
Los Angeles, Cal.
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Hard Drawn Copper Wire, Bare and Weatherproof. Rubber Wires, All Styles

MONARCH BRAND
WEATHERPROOF WIRES AND CABLES

Meet the most rigid inspection. If your jobber cannot furnish it write to

MONARCH ELECTRIC & WIRE COMPANY
CHICAGO

Liquid Wood Preserver

Phenoleum

DIELECTRIC MFG. CO.
SAINT LOUIS

SURFACE
IS WHAT COUNTS

No. 1 Anchor, 45 sq. in
No. 2 " 60 "
No. 3 " 75 "

If you are in the market for Anchors we can save you time and money.

Write Us

The Holden Anchor Company
Des Moines, Ia.

Pat. Jan. 9, '06

WATERBURY CO.

Telephone Cable

69 SOUTH ST., N. Y.

WRITE FOR SAMPLES AND PRICES OF

BELDEN
ROSIN-CORE
SOLDER

BELDEN MANUFACTURING COMPANY
194 MICHIGAN ST., CHICAGO

QUALITY FIRST!

GET SAMPLES AND PRICES OF

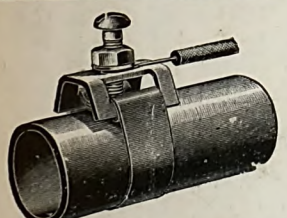
BEFORE BUYING

RUBBER COVERED WIRE AND CABLES

Manufactured By

Indiana Rubber and Insulated Wire Company
Jonesboro, Indiana

QUALITY AND PRICE DECIDE.



NEW YORK GROUND CLAMP

For connecting telephone ground wires to pipes and cables. Cheaper than a wrapped connection; as good as a soldered connection. Adopted by nearly the Bell Tel. Co.'s and most of the larger Independent Tel. Co.'s. Samples free on application. Write for list of other specialties.

YONKERS SPECIALTY CO.
Yonkers, N. Y., U. S. A.
Western Electric Co., Agents

Anchors that hold

5, 6 and 7 Inch Stombaugh Guy Anchors have no Welds or holes for pins or rivets in the Rods. Stombaugh Guy Anchors BORE into the Ground.

NO DIGGING.

When in at a depth of five feet they are set. The Strain can be put on without fear of any "Back Give." Write for Catalog, etc.

W. N. Matthews & Bro.
Manufacturers
206 N. 2nd Street, St. Louis

5, 6 and 7 inch Styles Holds 12,500. 15,000 and 17,500 Lbs. Respectively.

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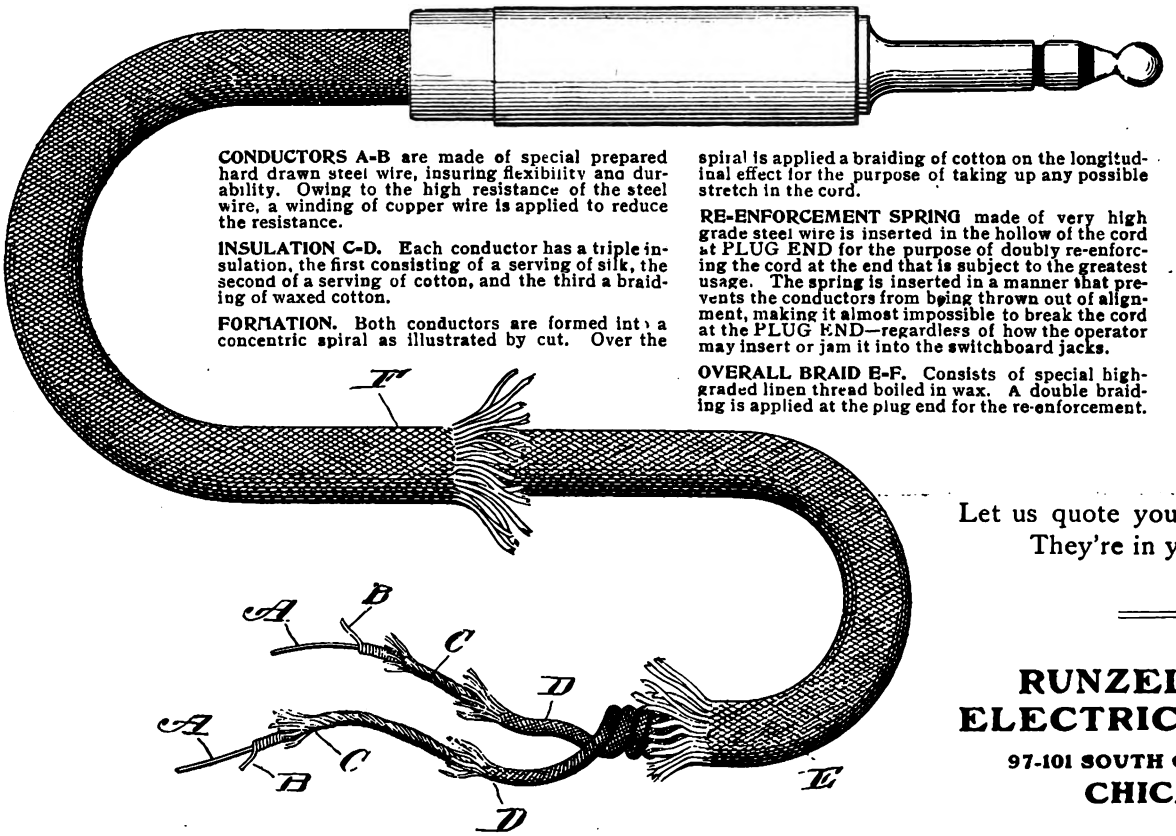
PREMIER BB STEEL CORD



CONDUCTORS A-B are made of special prepared hard drawn steel wire, insuring flexibility and durability. Owing to the high resistance of the steel wire, a winding of copper wire is applied to reduce the resistance.

INSULATION C-D. Each conductor has a triple insulation, the first consisting of a serving of silk, the second of a serving of cotton, and the third a braiding of waxed cotton.

FORMATION. Both conductors are formed into a concentric spiral as illustrated by cut. Over the spiral is applied a braiding of cotton on the longitudinal effect for the purpose of taking up any possible stretch in the cord.

RE-ENFORCEMENT SPRING made of very high grade steel wire is inserted in the hollow of the cord at PLUG END for the purpose of doubly re-enforcing the cord at the end that is subject to the greatest usage. The spring is inserted in a manner that prevents the conductors from being thrown out of alignment, making it almost impossible to break the cord at the PLUG END—regardless of how the operator may insert or jam it into the switchboard jacks.

OVERALL BRAID E-F. Consists of special high-graded linen thread boiled in wax. A double braiding is applied at the plug end for the re-enforcement.

The Only Successful Steel Cord

Let us quote you our new prices. They're in your favor.

RUNZEL-LENZ ELECTRIC MFG. CO.
97-101 SOUTH CLINTON ST.
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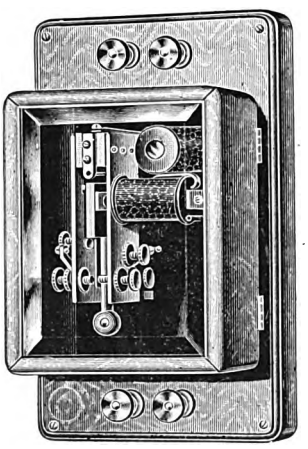
Do You Get Our Rings?



If not, you should order on 30 days' trial a

SANDWICH Pole Changer

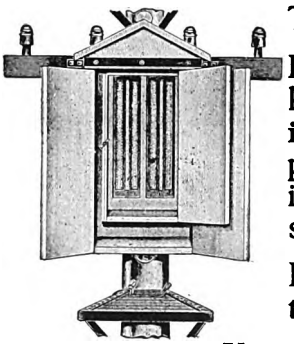
And get in line with all other **up-to-date** buyers of Power Ringers. Order the Sandwich Ringer, for it is **10 years** in advance of all others. Buy the ringer that will Ring your subscribers when all others fail. Buy the Ringer that produces the best alternating current at cost of 40 to 50 per cent less than any other.

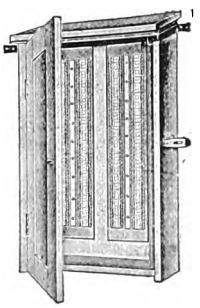
Made in four styles
$20, $25, $30 or $40

THE SANDWICH POLE CHANGER CO.
700 Eddy Street, SANDWICH, ILLINOIS

Send for Catalogue and Prices of the ILLINOIS OHMMETER, the Great Measuring Instrument.

Your carpenter could make as good Pole Houses as these, IF





That's it—**if, if, if.**

If he had the tools; **if** he knew your requirements; **if** he knew for what purpose the Pole House was intended and **if** he was a smart man.

But you can't afford to take chances.

You should buy Security Pole Houses because they never leak, warp, or look "ugly" on the pole.

We make them in two kinds, No. 1 and No. 2, and in all sizes.

If you'll write for our Security Book for further information you'll find it worth while.

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THE F. BISSELL COMPANY. TOLEDO, O.,
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SOUND WAVES

International Telephone Journal

VOL. XIV | CHICAGO, JULY 15, 1907 | No. 2

PUBLISHED MONTHLY BY THE
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ED J. MOCK, Editor. F. M. BAILEY, Advertising Director.

TELEPHONES: HARRISON 1521; AUTOMATIC 2904.

EUROPEAN OFFICE.....39 Maiden Lane, Convent Garden, London
S. RENTELL & Co., Representatives.

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Canada 1.50
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Requests for change of address should be made two weeks in advance, giving *old* as well as new address.

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Entered as second-class matter April 22, 1907, at the Postoffice at Chicago, Illinois, under the Act of Congress of March 3, 1879.

NOTICE TO ADVERTISERS.

Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisement can not be shown until the appearance of the edition containing it.

The publisher of SOUND WAVES *guarantees the advertiser a minimum circulation of 5,000 copies each month.*

CHICAGO, JULY 15, 1907.

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THE BELL PRESS BUREAU.

WE deplore the baneful practices of the Bell press bureau and condemn its vicious onslaught against Independents. With an inborn prejudice that can but naturally result from a contest having no apparent ending, we fail to detect any good in the matter which issues from Boston.

A careful analysis of all this matter must indicate the motive to be none other than to impress upon the unsophisticated the superiority of Bell securities over those of the Independents—a vigilant boost for more money for the Bell.

Without semblance of truth, the report went out from Chicago at the opening of the International convention, that Independent telephone men were convening to consider a merger of their properties in one great combination. It would be the purpose of the Independent combination to name and empower a committee which would treat favorably the Bell proposition to abandon the small exchanges if Independents would surrender to it the long distance business and larger cities. This was heralded as a "peace project"—an idea laid at the door of the Hoosiers. This illusionary "community of interests" between the Bell and the Independents was to bring sanity out of chaos. It would mean that the Independents, instead of losing money by its warfare agaist an invincible trust would, by its grace, become opulent.

Wasn't it all very beautiful?

But after all, those people who read carelessly and are attracted only to matters which directly refer to the Bell, had opportunity to swallow the sop. It clearly indicates the subtleness of the "oil vendors" of Milk street. Investors see that Bell securities are as attractive as the lithographer could make them and if they are not as good today as the owner had hoped, it would only be a matter of a little while until they were. It also shows that Independent securities are worthless—especially so, since the pipe has gone out and there was no getting together.

For finer work we are reprinting and commending an excerpt which accomplishes the same result by a different method, emanates from the same quarter, and cannot but impress upon holders of telephone securities of all kinds some of the troubles the management of the operating companies has to contend with:

The improvement in telephone cables within the past few years has revolutionized telephone line construction. Not only is it now possible to place in underground ducts cables containing 400 or even 600 circuits, but a pole line, the carrying capacity of which would have been exhausted by 40 pairs of open wires, can carry 600 pairs of wires in the form of cables.

The old fashioned exchange pole line rarely carried more than 20 pairs of open wires. Sound economy has many times in the past year required the scrapping of all the wires on a pole line, cable being substituted for them as the only way of secur-

ing the enlargement of facilities required, and not unfrequently has it been necessary to reconstruct the whole line as the cheapest way of securing the opportunity for growth that was required.

If the very great development of the business could have been foreseen, and the engineers and manufacturers had at an early date solved the cable problem so that cables of large capacity could have been originally installed, instead of open wire, in places where a large number of circuits would ultimately be required, much money would have been saved.

Now that it is certain that the business will develop on lines of reasonable profit to an extent much greater than even the most enthusiastic telephone man ventured to expect a few years ago, it would be the height of folly not to anticipate the certain extension of the business by providing facilities for growth when they can be most economically installed.

In the establishment of its department of publicity the International Association will evolve a system by which Independent securities will be improved. It will have sufficient information to disseminate and this will be clean. It is reasonably certain that the Independents will have the best of the argument, unless a reform will modify the method which prevails in the opposing organization.

LOOK FOR THE SHIELD.

ONLY a week ago we were in a city of some six thousand inhabitants where the Independent telephone system enjoys a monopoly with the exception of a single toll station in the most important hotel. We hunted up the hotel. The fittings and furnishings were in mission throughout. The Bell Company's booth stood beside the booth of the Independent Company. Both booths were alike—possibly due to the discriminating taste of a particular landlord. Did we say alike? In every particular except the sign that embellished one of them.

Which one?

There is scarce excuse to ask which one. Nine Independents out of ten know. The blue bell adorned the one—the absence of any mark distinguished the other. A neat enameled sign on the corner part of the large veranda surrounding the hotel was a blue bell. Within the office another blue bell sign indicated the location of the booth. You couldn't get away from it. It is like the Bell Company to do things in this way. It points out the place to obtain what service it has to offer, and does it with signs.

The Independents seem to be afraid to advertise. They depend too much upon the local stockholder and the local subscriber for publicity.

In this little city the Independent company is splendidly equipped to render long distance service. A considerable patron of long distance service is the commercial salesman. The salesman will find the most important hostelry and he is familiar, usually, with the larger city methods. He knows what the blue bell purports to stand for, but he is only superficially familiar with competitive service.

Show him the shield. Not once, but many times. And the mere nailing of them up in conspicuous places will not do it. Independent companies advertise too little. We have yet to see the shield in an advertisement over the signature of an Independent operator. A few have appeared on stationery and circulars that might have been included with letters to the present user of Independent service. The customer most to be desired is the one who does not use Independent service. One good way to get him is to advertise.

There are many makers of shield signs. The prices are reasonable and the product is good. Signs are necessary, but a generous spread of the shield with appropriate argument is most essential. The slogan, "Look for the Shield," is meaningless unless, when you look, you may see.

THAT MAN GARY.

EVERY city, town and village within a radius of five hundred miles of St. Louis lays claim to being the exact geographical center of the United States. Macon, Mo., since June 6, has full claim to the telephone center of North America and its people and press are consequently jubilant.

The new president of the International Independent Telephone Association lives at Macon. He is a big man at home as well as the most important officer of the association which has honored him. His name is Gary—the man, not the town—just plain Theodore Gary. After spending a score of years at insurance, real estate and banking, he took up the telephone business. When Mr. Gary goes into new things he doesn't bother about side lines—he goes in, hammer and tongs, for all that's in him. He knew that the telephone business was good before he adopted it. After ten years experience with it his opinion has not changed. The man who is big enough to respect the wants of his people has plenty to do in supplying good telephone service. Mr. Gary made good telephone service his hobby. Starting in a modest way at Macon, the system was extended first to include Nevada, then Joplin, Carthage, Webb City, Carterville and Independence. After a little while Mr. Gary was building Atchison, Kas., because one state at a time wasn't enough! At any rate the work was going right along in Missouri, and before long we heard of Mr. Gary in Topeka, and as a climax St. Joseph was added.

Mr. Gary has had help in his work. He has surrounded himself with hundreds of stockholders who have abundant faith in his ability to safeguard their investments.

He promises the International Association a business administration. A Gary promise is enough. The association will have a business administration. It will accomplish things—and it has much to do.

CONJECTURED BELL PLANS.

WHEN Theodore N. Vail succeeded Frederick P. Fish as president of the American Telephone and Telegraph Company it was everywhere believed by telephone men that a change in the affairs of the big trust would follow. Independents had hoped for an improvement in the manner of warfare, if nothing more. Although the time has been short, enough of the old method still exists to show that the Bell will continue the dirty practices which have prevailed heretofore and which may be likened unto the political bushwhacking in Podunk precinct. The Bell doesn't seek decency in treating with the public. Its policy was nurtured as a despot and it is evident that the majority of the "old school" still hold places in the organization and are not susceptible to reform.

Mr. Vail's personal ideas do not permeate the structure and doubtless they never will. This is something out of the ordinary, for it is usual with men who rise from obscurity to high places to take full credit for their achievement. Thirty-three years ago Mr. Vail lived in Omaha. His occupation was that of railway mail clerk. His proficiency was recognized from the beginning and by rapid strides he gained the superintendency of the mail system, with headquarters at Washintgon. He has always been a success. His record must lend emphasis to the thought that his ascendency to the presidency of the trust has other significance than that of chief executive.

It is currently rumored that Senator W. Murray Crane of Massachusetts is doing the scene-shifting stunt for the big trust these days, and that Mr. Vail is a fig-

urehead. Mr. Crane appears only as a director of the Bell Company, but, as SOUND WAVES pointed out in April, he wields a tremendous influence in the affairs of his company. Senator Crane, no doubt, is responsible for Mr. Fish's retirement. While it has been hinted otherwise, this conclusion is apparent when it is now evident that the senator is heading a big syndicate to purchase a controlling interest in the Bell Company. It has been usual for us to believe that the Mackay Company was the largest stockholder in A. T. & T. It now develops that Senator Crane himself is the largest individual owner of shares. These large interests, associated with others, plan to gain the mastery of the parent Bell and all its subsidiary companies. If they succeed, we shall possibly have another change in executives.

THE HOUSE ORGAN.

AT the recent annual convention of the International Independent Telephone Association this resolution was passed:

WHEREAS, The Independent telephone journals of the country have rendered the cause of Independent telephony invaluable service during its existence, and are constantly placing before the public the whole truth in regard to the movement, and

WHEREAS, We fully appreciate the great work they are constantly engaged in; therefore,

Be It Resolved, That this convention extend to them hearty thanks for their past efforts, and in order to encourage further efforts recommend that the rank and file in the Independent telephone field support them loyally by patronage and subscription.

The act of the convention came as a complete surprise to the publishers of Independent telephone journals, who will no doubt admit their loyalty and earnestness in advocating Independent interests and who will unblushingly acknowledge that they conscientiously have endeavored to present the truth. The greatest convention in telephone history has declared its full appreciation of the publisher's work and solemnly avowed its intention to encourage him to greater effort. This is all very fine and it would be most unbecoming to pass the compliment without notice.

It would seem, however, that the resolution has failed to be specific enough. It does not define "Independent journals." That the resolution was intended as a deserved courtesy to the legitimate publisher whose daily labor is confined entirely to his chosen field, goes without saying, but as the record stands it is broad enough to take in all of the "house organs" and the manufacturer- or supply house-publisher" as well.

These house organs may exert a beneficial influence in the development of Independent telephony, but we doubt it. Their principal business is to boost the business of their "house." How well they do this will always remain the secret of their promoters. Affiliated interests of the Independent movement have taken kindly to the "house organ." Some of the manufacturers of telephone apparatus are patrons of their own Independent telephone journals to an amazing extent.

The "house organ" has come and gone through every phase of industrial development. The newer the industry, the more numerous are these "organs of trade." Right now the telephone business is burdened with them —all kinds, but all alike in purpose.

These publications are expensive experiments at best and require much more time to prepare than would several pages of advertising for the legitimate trade publications. The cost is relatively much more than advertising in the usual way. They will survive or perish as they are able to render service to the house,—perhaps. We have known instances where the house organ became more of a "grind organ" on the funds of the house, which continued it merely because of lack of courage to kill it.

To revert again to the resolution of the International convention, it would appear that "house organ" exploiters interpret the meaning to include their publications. Some of them are openly soliciting business in competition with what we are pleased to term the "legitimate" journals and they are meeting with encouragement that characterizes the generous spirit of the manufacturing and supply interests. The "house organ" circulates ostensibly to an "exclusive list." A few still believe there are vast differences in lists. There is very little. We are quite in position to make the confession.

The thing most to be deplored is the free circulation. Any one can have any house organ by requesting it. If not interested to the point of making the request, you are very apt to get it anyway—it's free. It is impossible to say more, because any product that is without cost cannot be compared with another product that has a fixed value.

We are inclined to the belief that the Association should have designated the journals it meant to compliment and encourage.

CONTINUING PROSPERITY.

PESSIMISTIC trade predictions are continuously overbalanced by the ever present signs of prosperity. To those of us who must look far ahead in framing our buiness methods and operations, these discouragements to the prophets of evil are most gratifying. We like the optimist. We are face to face daily with his stock in trade. We cannot avoid observing the recurring announcements of proposed extensions, increased capitalizations, remodeling and rebuilding. The manufacturer and supply dealer are busy. The operators and construction men are more so. Any indication of unrest or distrust must therefore be imaginary.

The only condition that may have been responsible for any untoward expression concerning the Independent telephone business as a whole may be charged to the high price of copper. The rising price of this important commodity might have had a marked tendency to curtail extensions of long distance lines, but it didn't. The slight decline in the price has offered no added incentive. It is seldom that buying on a large scale follows a falling market. Construction goes steadily forward.

With Independents, despite all conditions, whether the price of the essentials is high or low, the clamor for good telephone service is ever present and to meet this demand, restricted expenditures are not countenanced.

POSTAGE RATES TO CANADA.

ON the eighth day of May the postage rate for second class periodicals addressed for delivery in Canada was raised from the rate of one cent a pound to "one cent for each four ounces or a fraction of four ounces, calculated on the weight of each package and prepaid by means of postage stamps affixed."

The meaning of this simple announcement is very important both to publishers in the United States and subscribers in Canada. It means that most of the magazines and newspapers in the United States will increase their subscription price to Canadians. Instead of being able to mail SOUND WAVES in Canada hereafter at the pound rates—the same as in the United States—postage stamps will have to be affixed on each copy and the rate is eight times higher. In conformity with this new demand upon us and concurrent with the announcement

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of nearly all publishers for increased rates, Sound Waves raised its price for Canadian subscriptions to $1.50 a year.

American publishers very generally deprecate the new arrangement entered into by the United States and Canadian postal authorities and hope that some new arrangement will be brought about at no distant date that will restore the same rate existing heretofore. We are of the opinion when Canada puts a tariff upon the dissemination of knowledge among its citizens, it is doing her own people a great injustice and is blocking the way of Canadian progress.

We regret the future added cost of subscriptions to our Canadian subscribers. Such subscriptions as we have already entered at the old rate will, of course, be filled at the old rate, but the tax upon us is very considerable because of the very large patronage that has come to us from Canada, and especially from Manitoba, where the provincial government itself orders 200 copies monthly.

TOO RAPID READING.

IN this day of books and periodicals there seems to be no lack of reading matter, if we shall judge only the bulk of that which is printed every month and every year. The time was when trade journals were scarce and costly. But now almost every trade has its paper and the price is usually within reach. There is consequently very little excuse for a man not being informed in his particular line of work. If he does not read, he is on the road to the shelf, while the man who is progressive will take his place. In the midst of all this reading matter we are likely to become confused by the very mass of it. It is hard sometimes to choose what to read out of all that is offered. Few men have time to read their own trade papers. This begets the habit of "skimming" over the reading matter, a practice which is as disastrous to the brain as rapid eating is to the stomach. Many a good article is lost to the reader because it is merely looked over hastily and not digested. A physician once said that it is not the food which we eat that sustains our bodies, but only that which is digested and absorbed. The mental analogy is very close. We may skip over an article and get a general idea that the writer is treating a certain subject. We may even notice the manner in which he treats it, but a week later we cannot remember anything of value. It has done us no good.

It is a good plan to look a paper over to see if it contains that which is of interest, especially if one is crowded for time. Mark those articles which appeal to you and read them carefully. Analyze what is said. Think it over. It may contain much of importance which does not appear on the first reading. By thinking it over the real value will appear. Possibly you will not agree with the author of the article. If so, do not keep still, but write your thoughts and observations to the editor. The art and science of telephony grows best by the united effort of all.

A WORD FOR OURSELVES.

WE are far from being dispirited. Within a period of ninety days we have been able to increase the gross earning power of Sound Waves 66 2-3 per cent and we are confident, judged by the expressions that voluntarily come to us from all quarters, that the publication itself has been improved 200 per cent. And the end is not yet.

Sound Waves for June was the only Independent telephone publication which *reported* the convention proceedings of the International Independent Telephone Association. Besides doing this, it did not neglect its several important departments.

No other issue of an Independent telephone journal carried so much "reader." The text was really too large, but we were only partially to blame for that, because we cannot lay full claim to being responsible for the International Association. Our responsibility is only partial!

We were pleased with the June issue—more than pleased with this one. The encouragement seems to be merited and continues unabated. That we are grateful beyond the power of words to express should be taken for granted.

THE CHICAGO SITUATION.

THE fight against the Chicago Telephone Company's application for an extended franchise grant is without parallel in telephone history. It has reached a period bordering the sensational, and something new breaks forth with each rising of the sun. Nearly every civic organization in Chicago is arrayed against the local Bell Company. The Manufacturers' Telephone Company, the Independent organization, is bringing its far-reaching influence to bear toward the defeat of the ordinance which shall perpetuate the power of the Bell.

It is declared that the Independents hold the whip of the law with which to subjugate its rival and that the ordinance will never pass unless it is modified to conform more reasonably with the demands of the citizens. It is highly probable that the Independents will not only secure a franchise, but that they will also have the satisfaction of serving the community by dictating the policy which shall govern their opponent.

The Chicago and Western Telephone Company, which was organized by the Independent telephone interests for the purpose of taking over the Illinois Tunnel Company's automatic service in Chicago, is ready to begin business in the local field. The company has completed its engineering plans, and bids for construction work are to be called for. The contracts to be given out will aggregate an expenditure, it is said, of several millions of dollars, and it will require from five to six years to complete the new system. For the purpose of taking care of the long distance business of the company three auxiliary companies have been organized, each with a nominal capital of $5,000—the Chicago, Milwaukee and Northern Long Distance Telephone Company, the Chicago, Indiana and Eastern Long Distance Telephone Company, and the Chicago, St. Louis and Western Telephone Company.

It is needless to expect any material progress, however, until the present contest reaches settlement.

MISSOURI WANTS CHEAP TOLL SERVICE.

REPRESENTATIVE BROOKS introduced a bill in the Missouri house to regulate long distance telephone rates. Briefly, it provides that for long distance communications, between 6 a. m. and 6 p. m., the charge for the first fifty miles or fractional part thereof shall be twenty cents, and for each additional fifty miles or fractional part thereof, five cents, and for the use of any telephone at night, between the hours of 6 p. m. and 6 a. m., the rate shall be one-half that charged in the daytime. Drastic punishment is prescribed for violations of the act, in that it provides that there shall be a forfeiture of charter and all privileges, in addition to which a fine of from $100 to $500 may be imposed.

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Reasons for Transposing

By Arthur Bessey Smith

THE subject of transportation is one of increasing importance in the telephone field. From the beginning, it was shrouded in mystery, as was the cause of cross-talk and inductive noises against which transpositions are the only known remedy. Magnetic induction was known to practical engineers for a long time, as it was of great importance in the transformer and similar devices. The effects of capacity in leyden jars and condensers were also known and the principles applied in limited ways. Since the power engineers dealt with currents of large amperage, they noticed the effects of induction from one wire to another carrying alternating current. This was easily proven to be due to magnetic lines of force in the space around the wire. If a wire carries 100 amperes, there will be a certain intensity of magnetism in the space surrounding the wire. If we coil this wire on a core, all the lines of force of all the turns will be concentrated in the core, excepting a very few which leak through the space between the coils and the core. The more turns, the greater will be the intensity of magnetism. If we straighten the wire out into a straight line, the lines of force are there just the same, but not as many. It is as if we have a coil of a single half-turn.

In Figure 1, let us suppose *G* to be an alternating current generator driving *M*, which is a motor at the other end of the line. T_1 and T_2 are two telephones connected by a line parallel to the power line. Neither line is transposed. This makes *2* and *3* nearest and *1*

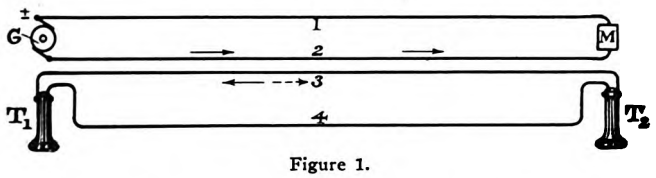

Figure 1.

and *4* farthest apart. Suppose at a given instant the current in *2* is flowing as arrowed. As the current rises in strength, the induced current in *3* will flow in the opposite direction as shown by the solid arrow. After the current in *2* has reached its maximum, it will begin to *decrease* in strength. This will induce a current in the wire *3* in the *same* direction, as shown by the dotted arrow. A very important point to be noticed is that the induction causes the current in *3* to flow in the same direction at every point in the length of the wire. There is in the wire, *3*, a small voltage produced by the current in the power line, which at any given instant acts in the same direction at every point from T_1 to T_2. There is a similar voltage induced in the wire, *4*, but it is very much weaker because the latter wire is farther from the power line than *3*. These two voltages oppose each other, but since that in *3* is stronger than that in *4* it overcomes it. The real voltage is the difference between the two.

Let us now try the effect of a single transposition in the middle of the line. Figure 2 shows the idea. The transposition divides the line into four parts, 3a, 3b, 4a, and 4b. In 3a and 3b the voltage induced will be greater than those in 4a and 4b. Let the lengths of the arrows indicate this point. At first sight it seems that the voltages in 3a and 3b are acting in the same direction. A closer inspection shows that 3a tends to drive current *downward* through T_1, while *3b* tends to cause it to flow *upward*. Similarly *4a* and *4b* have been made to oppose each other. As far as magnetic induction is concerned, a single transportation in the electrical middle of a line will render it quiet.

When a single transposition has been put in the

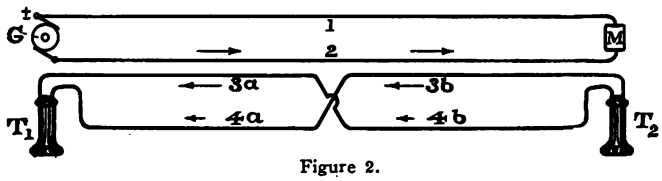

Figure 2.

middle of the telephone line, it will be found that it is still far from quiet. It must be that there is some other cause at work in the case. That other cause is known as static capacity, or the condenser effect. We usually think of a condenser as composed of two plates or sheets of metal separated by an insulating material. Along with this comes the idea of great area in connection with the plates. In order to make a condenser which will have enough capacity to be used satisfactorily in electrical measurements, power work, etc., a great number of square feet of surface of tinfoil is required. The telephone receiver will detect the presence of very much smaller capacity. You can talk through a condenser made of two coins with a piece of paper between them. You can also talk through a condenser made of two wires a foot apart and several miles long. In our case of a power line close to a telephone line, all of the wires have a condenser relation to each other. Since *2* and *3* are nearest, they will have the greatest mutual capacity and hence the greatest influence on each other. Wire *2* will have its effect on *4*, but to a less degree. When the dynamo is trying to force current into wire *2*, the charge on that wire becomes positive. This positive charge tends to attract all the negative electricity in the whole telephone line and to repel all the positive. In getting away from wire *3* all the electricity in the right half will flow downward through the telephone, T_2. All that in the left half of wire *3* will flow downward through T_1. This makes the center point, P_3, a sort of neutral point, for from it the current flows away in both directions. Hence, there is no current flow at P_3. This has been proven to be the case by inserting a receiver in series with the line at the point. Even if T_1 and T_2 were very

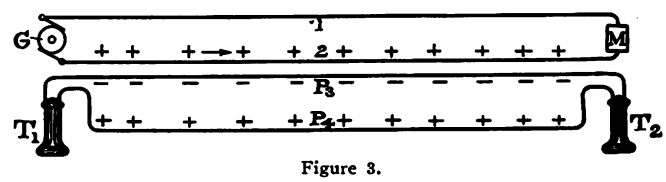

Figure 3.

noisy, there was no sound in the receiver at P_3, except that which was clearly due to magnetic influence. The point, P_4, acts in exactly the same manner.

If we now transpose the line at P_1 and P_2, we shall have a changed condition. See Figure 4. Again we have our telephone line divided into four parts, lettered the same as in Figure 2. We find the same influence of the power wire, *2*, on both sides of the telephone circuit.

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But the amount of electricity which will be discharged through T_1, will not be that coming from half of wire *3*, (Figure 3), but from only a portion of 3a, (Figure 4). This is because the charge on 3a which must pass off in some way, has now two paths, one through T_1 and the other through the transposition wire at the center. The same will hold for T_2. The relative amounts which will be discharged through the telephone or the transposition wire will depend on the relative each which the two paths offer. If they were equal, then the neutral point would be at the center of 3a, that is, at one-quarter of the total length of the line. But the telephone is a coil of wire on a core, and has about 80 ohms resistance, while the transposition is a plain wire not coiled at all. Hence more than half of the charge will go by way of the transposition, leaving the receiver to get less than half of the

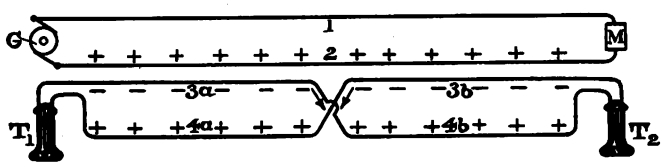

Figure 4.

charge on 3a which is less than one-fourth the total charge on the entire line. The neutral point will not be at the middle of 3a, but somewhat nearer the telephone.

The foregoing explains why one transposition at the center of a telephone line will not free it from noises or cross-talk. It will reduce the loudness, but that is all. In the case we have assumed it is very likely that both the magnetic and static effects are responsible for the noise on the telephone line, for the large current carried by most power lines will cause quite a strong magnetic field. The case of cross talk is of almost negligible strength and cannot produce a very intense magetic field. In fact, it has been proven beyond the possibility of a doubt that cross talk is caused entirely by the condenser effect. The magnetic effect is so small as to be absolutely negligible.

The only reason that we are able to transpose against cross talk is because if we transpose many times, we reduce the noise in the receiver to the point where it cannot be heard. It is still there, but so weak that the ear cannot detect it. Many people are satisfied when they have the noise reduced so as not to interfere with conversations, although it may be plainly heard while waiting. It often occurs that some lines cannot be made to be entirely quiet, owing to very strong inductive influences.

The necessity for transportation varies with the local conditions. In a region which is full of power lines, interurban railways, city trolley lines, etc., the disturbing power may be very strong, and even the shortest lines must be transposed with great care. In districts which have not yet been reached by these disturbances, even grounded lines may be tolerably quiet. In this case, the short metallic circuit would seem not to need transposing. If it were never to be connected to any longer lines, the need for transposition would be absent. But every progressive exchange has its toll lines, which reach out all over the country. To give the best service, all the lines which are to be connected to toll lines must be metallic and well transposed. You cannot give good service over lines, the parts of which are not uniformly designed. A line may be quiet enough untransposed when alone, which may be very noisy when connected to a long line, even if the long line is transposed.

There seems to be a notion among some people that it makes a difference in a transposition whether one of the wires is carried *over* or *under* the other wire. According to their idea, if at the first transposition the left hand wire be carried *over* the right hand wire, the same must be done at all succeeding transpositions. The statement has even been made in print that if the first transposition carries the left wire *over* and the second carries it *under*, there would be no transposition at all.

There is nothing in the theory of transpositions which could possibly lead to such a conclusion. Practice has shown that no attention need be paid to passing the same wire over or under the other in the same manner every time. The effects of induction, either static or magnetic, are not affected by the manner of making the transposition. It is the relative exposure of the two sides of the metallic circuit which fixes the quietness of the line.

The Law and the Telephone

By George H. Murdoch, Jr.

RISKS ASSUMED BY TROUBLE MAN.—The wire chief of the Bell Telephone Company received word at his office in East St. Louis that certain of the telephones served by company's drop lines leading to the Metropolitan building, situated at the northwest corner of Fifth street and Missouri avenue, in that city, were out of order, and the trouble man was sent by the wire chief to what was known as the cable pole, located in the vicinity of the service complained of, to open the line and discover whether the trouble lay between the cable pole and the office, or between the cable pole and the disabled telephone. He proceeded to the cable pole and began to climb it. As he laid hold of a guy wire affixed to the cable pole at a distance of about ten feet from the ground, he was seen to shudder and fall to the sidewalk, striking upon and fracturing his skull, from the effects of which he died shortly after. The accident resulted from the sagging of the drop lines (which were originally constructed so as to run over and across certain electric light lines carrying a current of high voltage) down upon the latter in such a manner as to charge the drop lines, and through them, by means of certain so-called bridle lines upon the cable pole, the said guy wire with a high degree of voltage.

In an action brought against the company for its alleged negligence resulting in this death, it did not appear that either of the parties knew of the condition existing in the said guy wire at the time. From the evidence it appears that the cable pole is wrapped with wire, commencing about eighteen inches from the ground, and extending upward to about six feet. Fastened around the pole, and in contact with this wrapping of wire was a peanut stand, so arranged as to form a circuit medium from the wire to the ground. A man standing upon the wire and grasping the guy wire formed a complete circuit. There was a judgment in favor of plaintiff in the United States District Court for the eastern district of Illinois which has just been reversed by the Circuit

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Court of the United States in said district, and remanded for new trial. The opinion of the latter court is in part as follows:

"The sole ground of action set up is that the telephone company was negligent in the construction and maintenance of its wires over and across the electric light wires, whereby the guy wire became charged with a dangerous current, causing the death complained of. Unless the fact that the wire sagged down upon the electric light wires establishes negligence in construction and maintenance thereof, there is nothing in the record sustaining the charge of negligence. On the other hand, it appears that there was a storm of considerable violence on the evening preceding the discovery of the defects in the telephone service. The fact that the failure in the telephone service followed this atmospheric disturbance fairly justifies the inference that the wires were properly maintained up to that evening. It is shown that they had been in position for a number of weeks without complaint being made.

"It is the theory of the defendant in error that the wires had been gradually sagging, for want of proper construction, for a considerable time, and upon this night came down upon the electric light wires. This is mere conjecture. The record discloses no evidence upon which the jury could base such a finding. Moreover, decedent of defendant in error was charged as one skilled in the business with the duty of ascertaining the cause of the interruption of telephone service. He was seeking the very trouble which killed him. He knew that something was wrong, and that the business was very dangerous. He knew he could protect himself by the use of rubber gloves, and that such precaution was usual. There were no representations made to him that anything about the premises were safe. The crossed wires were not easily discernible. Nobody knew what was the matter. Nor is any lack of diligence on the part of defendant below shown. The danger came clearly within those assumed by him when he entered upon the occupation of trouble finder for plaintiff in error."—148 F. 371.

CONSTRUCTION OF LINE—NEGLIGENCE.—Wisconsin Revised Statutes, 1898, Section 1778, as amended, authorizes the construction of telephone lines on public highways, but provides that no such lines shall at any time obstruct a public use of the road, and Section 1329a requires all wires to be strung not less than twenty-four feet above the ground at all crossings and not less than fourteen feet at all other places. *Held* that, where the Clinton Telephone Company permitted a guy wire so to sag that it was only thirteen feet above the traveled track, and a grain elevator of Joseph Chant's threshing machine struck the same and was injured, as Chant was hauling the same along the highway, the telephone company was negligent and a judgment for $74.80 against the company was affirmed on appeal.—*Chant v. Clinton Telephone Co.*, 110 N. W. 423.

EMINENT DOMAIN—REMEDIES OF LANDOWNERS.—Where defendant telephone company constructed its lines along a highway without obtaining the consent of the owner of the fee, and without condemning such right, mere delay on the part of the owner of the fee in instituting suit to enforce his rights short of the period prescribed by the statute of limitations, did not deprive him of the right of an injunction to restrain the continuance of the obstruction.—*Burrall v. American Telephone & Telegraph Co.*, 79 N. E. (Ill.) 705.

DISCRIMINATION BY TELEPHONE COMPANY.—J. C. Yancey of Batesville, Ark., is suing the Batesville Telephone company under the statute of that state which provides against discrimination by a telephone company as between its subscribers.

Yancey in his petition alleges: "That said defendants, through their agents and employes, have discriminated and shown partiality against this plaintiff continuously each day for the past twelve months. That such discrimination and partiality consisted in this, to-wit: That while other subscribers of said telephone exchange are permitted to be connected from their respective residences and places of business through said telephone exchange for the purpose of transmitting messages and communications to divers parts of the state and other places over the long distance lines connecting in said exchange to divers parts of the state and other places, and for such service they are charged at the office of the said exchange and the bills therefor presented at the end of each month, with this plaintiff, although he is a subscriber, and has been such continuously for more than twelve months, for one or more telephones connecting his residence and place of business with the exchange, said defendants refused, and have continued to refuse, and still continue to refuse, to connect his residence or place of business with said telephone exchange for the purpose of transmitting or communicating messages over said long distance lines to subscribers and others at divers parts of the state or elsewhere, unless this plaintiff should first come to the central office of said exchange and pay cash in advance for such telephone messages, service, and communication; but that with other subscribers to said telephone exchange, who reside in Batesville and bear the same relation to said telephone exchange as this plaintiff, such charges are made at the time the service is rendered and presented to them, respective, at the end of each month.

"That the plaintiff has complied with and offered to comply with every reasonable rule and regulation made by said defendant company; that he is a subscriber, and has been continuously for more than twelve months, for two telephone instruments, one at his residence and one at his place of business in the city of Batesville, and for this service he is charged as other subscribers and his bills presented to him at the end of each month, as to other subscribers, and he always promptly pays the same in due course of business, as other subscribers.

"That the discrimination above mentioned has continued each and every day for more than twelve months last past, and that such discrimination is illegal, unwarranted and unjust to the plaintiff; that by reason of said illegal discrimination and partiality shown against this plaintiff the defendants have subjected themselves to a penalty of $100 for each and every day for the last twelve months, aggregating 365 days and amounting to $36,500."

The action is based upon the following statute:

"Sec. 11. Every telephone company doing business within this state, and engaged in a general telephone business shall supply all applicants for telephone connections and facilities without discrimination or partiality, provided such applicants comply or offer to comply with the reasonable regulations of the company, and no such company shall impose any condition, or restriction, upon any such applicant, that are not imposed impartially upon all persons, or companies, in like situations, nor shall such company discriminate against any individual or company engaged in lawful business, by requiring, as condition for furnishing such facilities, that they shall not be used in the business of the applicant, or other-

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wise, under penalty of $100 for each day such company continues such discrimination, and refuses such facilities after compliance, or offer to comply, with the reasonable regulations and time to furnish same has elapsed; to be recovered by the applicant whose application is so neglected, or refused."

The defendant demurred to the petition, and the demurrer being sustained in the trial court, Yancey took an appeal to the Supreme Court of Arkansas, which has reversed the order sustaining the demurrer and remanded the case for trial.

In its opinion the Supreme Court says:

"Every company is entitled to compensation for telephone facilities furnished by it. It may require the charges for such services to be paid in advance. This power is given it for its own protection. In the exercise of it, it may extend credit for such charges to persons it may deem deserving. This is a reasonable exercise of the power and it is essential to its success. No rule can be laid down by which the credit to which each person is entitled can be determined. This is dependent upon various circumstances, such as the amount of property he may have over and above his exemptions and liabilities, his promptness in paying his debts, his being contentious, a wrangler, a fault finder, his honesty, integrity and other qualities. The credit due each individual depends upon himself. It cannot be fixed by any rule, but must be and is left to the company to determine. The statute forbidding discriminations does not deny the right. It does not come within the evils the statute was intended to suppress. All are required to pay the same rates for the same service in like situations, but the time when it should be paid is within the peculiar province of the company to determine. This is a right of creditors, and there is no reason why it should be denied to telephone companies.

"Appellant (plaintiff) alleged in his complaint that, "although he is a subscriber and has been such continuously for more than twelve months, for one or more telephones connecting his residence and place of business with said exchange, said defendants refused, and have continued to refuse, and still continue to refuse, to connect his residence or place of business with said telephone exchange for the purpose of transmitting or communicating messages over said long distance lines to subscribers and others at divers points of the state, or elsewhere, unless this plaintiff should first come to the central office of said exchange and pay cash in advance for such telephone messages, service, and communication; but that with other subscribers to said telephone company, who reside in Batesville, and bear the same relation to said telephone exchange as this plaintiff, such charges are made at the time service is rendered, and presented to them, respectively, at the end of each month. The requirement that appellant should first go to the central office of the exchange and pay cash in advance for such telephone message, service, and communication, when it was not required of other subscribers was an unreasonable and unnecessary discrimination and is forbidden by the statute. The payment of the charge is all that should concern them in that connection. All else is arbitrary and unnecessary."—99 S. W. 679.

The Telephone Wire Plant

By Sergius P. Grace

TELEPHONE engineering has been looked upon by many engineers as principally a switchboard problem. The switchboard problem was undoubtedly deserving of the great amount of attention given to it by telephone engineers, and the results are everywhere evident today in the perfect working mechanisms of the modern, central battery switchboard. An analysis of the construction costs of the telephone plant will, however, show that from two-thirds to three-fourths of the total expenditure is required for the outside plant; that is, for conduits, poles, cables and wire. Because of the very large proportional expenditures for the outside plant it becomes evident that the systems of line distribution should be most carefully studied in order that the best service may be given at the lowest cost.

In considering a telephone plant for a community, the first thing to be done is to decide upon a proper development plan for the growth of the business for a reasonable number of years. In view of the rapid advances in the telephone art and the possibilities of the introduction of new systems of transportation and communication, it would seem that fifteen to twenty years is as far ahead as we are justified in planning telephone development. If the plant is to care for service offered during this period, it must be originally so laid out and designed that the additional subscribers can be taken on without the redesign and reconstruction of the plant. From time to time the development plan can be revised so as always to keep it from fifteen to twenty years ahead of the plant. In laying out a telephone development plan for a city, there are many things to be considered. The growth in population for the last ten years must be carefully considered; from all possible sources of information a prediction should be made of the population for the next ten to twenty years. It next becomes necessary to determine upon the percentage of development which may reasonably be expected; that is, the ratio of telephones in use to the population. This will vary considerably with the prosperity of the community and whether there are large manufacturing districts employing low grades of labor. It seems certain that this development in the ultimate will lie between 15 and 30 per cent of the total population. A careful estimate must also be made of the ratio of lines to stations. Thus, if a very high party line development is expected, the ratio of lines to stations will be low. Today the telephone line really means more to us from the wire plant standpoint than the number of telephones. Formerly we used to consider the number of telephones as affecting the wire plant; now it is the number of lines. Because of the introduction of private branch exchanges two or three trunk lines may care for fifteen or twenty telephones, or there may be a number of telephones on one line, so it is the line in which we are interested.

After having looked over the city in a general way and obtained the best available data regarding the industries and the growth of the population in various parts of the city, the next thing to do is to resort to a detailed count of all the buildings, and block by block make an estimate of the number of telephones expected

A paper presented at the 218th meeting of the American Institute of Electrical Engineers, New York.

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at the end of various periods during the next twenty years. In addition to the count of the present buildings, an estimate should be made of the probable ultimate number of the various classes of structures in each built up block of the exchange area. In providing for the number of lines to be installed at once, which at the same time should provide for to or three years' growth, the present number of lines in each block should be determined and to this number about one-third more lines should be added. This will vary in different cities and must be the subject of a special study in each case.

After having made a study of each block in the exchange area and determined the probable number of lines and stations at the end of each five-year period during the next twenty years, the entire number of lines and stations as shown by the block map should be summed up and carefully compared with the ultimate

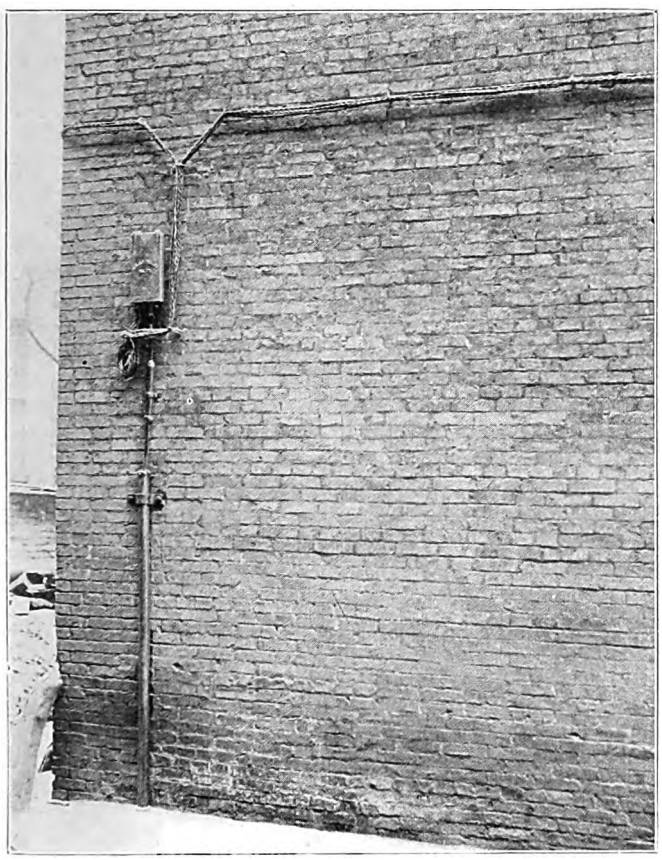

Figure 1.

Figure 2.

figures deduced from the general development plan which is based upon the character of the city and the probable growth in population. If the estimates arrived at by the general development scheme and the detailed block scheme do not compare favorably, both estimates should be gone into again most carefully to determine the possible errors. In a city of about 40,000 inhabitants the map should be marked with the numbers of the various classes of houses. At the left of each block in circles should be shown present number, and at right should be shown ultimate number of houses.

When the number of telephones in each block for the twenty-year study has been decided upon, it remains to determine the most economical grouping of these telephone lines into exchanges. In small cities where the number of telephone lines in the ultimate will not exceed 8,000 to 10,000, it is reasonably certain to assume that one exchange will prove the most economical. If the district is very much scattered or very much elongated this is not true, and the proper number of exchanges should be determined in a manner to be described later. If one exchange is decided upon, a location for this exchange must be determined which will make the subscribers' line wire mileage a minimum. The determination of this center with extreme precision is a problem for the calculus. The most simple case is when the streets are all rectangular, in which case the mathematical center of distribution is found by drawing lines at right angles through the exchange area, so that the number of telephones in the ultimate on each side of the lines is the same. If the present center is a considerable distance from the ultimate center, a mean center between the two should be decided upon.

When the center is determined, a complete conduit system should be laid out, touching at least one side of every block in the exchange area. It will never be necessary to construct all this conduit at once, and perhaps even in the ultimate much of it will not be installed, but if a definite plan is prepared the conduit extensions from time to time will be of correct dimensions and in the right direction. This conduit must, of course, feed to the exchange center by the most direct routes possible, and the lines should be concentrated in the smallest number of subways which will not affect the efficiency of the distributing system. Since it is known from the development plans the number of lines in each block at the present and the ultimate periods, a skeleton feeder plan carrying these pairs back to the exchange center can readily be prepared, and from this it is easy to determine the number of ducts and sizes of manholes in the various parts of the subway. In general, the terminal cables feeding into the block should be of the ultimate size, while the feeder cables back to the ex-

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change center should be so proportioned as to care for the growth in business for from two to five years. In the districts where conduit is not constructed, pole lines may be used for distribution and feeder purposes.

In the case of a large city where it is evident that a number of offices will be required to furnish the service, it is a very complex and complicated problem to determine how many exchange districts there should be. The cheapest number of districts will vary as follows:

1. With the grade of talking transmission.
2. With the subscribers' mileage—varies directly as the number of offices.
3. With the *A* and *B* position equipment—varies directly as the number of switchboards.
4. With the multiple jacks—varies inversely as the number of switchboards.
5. With the rent—varies directly as the number of offices.
6. With the office constant—varies directly as the number of offices. This office constant takes care of the equipment which is common to all offices, such as the charging dynamos, storage batteries and power boards.
7. With the central office labor—varies directly as the number of offices.
8. With the trunk mileage—varies directly as the number of offices; also on number of calls per line and per cent of trunking.

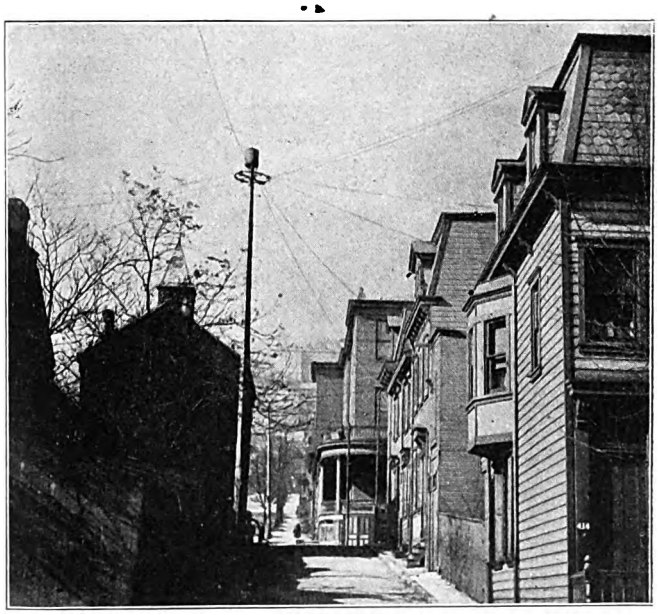

Figure 8.

Good telephone service is fundamentally based upon good talking efficiency. The means for transmitting the talk is what the telephone company really furnishes to the subscriber. In very large city districts, because of the distances between the central offices, the cost per message is materially increased on account of the high-grade trunk plant required to give the subscribers good transmission. The central battery system of subscribers lines has proved very efficient and economical from service and maintenance standpoints. There is, however, a considerable loss introduced into each line by the ohmic resistance which operates to cut down the flow of current through the transmitter. In addition, then, to the attenuation loss present in all cases we have added to this in the transmitting loop a loss due to the reduction of the current through the transmitter.

In designing the subscribers lines, 22-gauge cable should be used as much as possible. In the case of a large city with a number of central offices there is a limiting resistance for the subscribers' lines which can not be exceeded without making the trunking plant very expensive. This limiting resistance of the subscribers' line will vary in different cities because of the varying distances between central offices which affects the trunk line mileage. In general the subscribers' and trunk line plant must be so designed that while there will always be good talking transmission between the subscribers, the annual charges on both the subscribers' and trunk line plant will be a minimum.

To lay out a city in the correct number of districts all the foregoing items mentioned must be given careful consideration. From past experience it is generally possible to predict approximately the number of districts which will be found most economical. A number of districts above and below this value should be decided upon, and the costs and annual charges for each of these three groupings should be carefully calculated. The first cost and annual charges of all the variables given on preceding pages must be known in order to make these comparisons. Our past experience indicates that the following is about the best theoretical number of districts for cities of various sizes:

	OFFICES.
For an ultimate of 10,000 lines or less	1
For 10,000 to 15,000 lines	2-4
For 15,000 to 25,000 lines	5-8
For 25,000 to 35,000 lines	6-10
For 35,000 to 50,000 lines	8-12
For 50,000 to 100,000 lines	10-16

After the number of offices have been decided upon and the conduit study following the general development plan is made, it yet remains to construct the outside plant so as efficiently and economically to connect the subscribers by means of the wire plant to the central offices. Conduits should be built in the congested districts and along what may be considered as main feeder routes. In general it is economical to construct at once a conduit if 400 to 800 pairs of wires are expected within five years. In the vicinity of the underground conduit system every effort should be made to connect the subscribers without resorting to aerial construction. Where the buildings are large and permanent and an average of ten telephones per building may be expected, the best method of construction is a cable directly into each building from the nearest manhole in the main conduit system. In the case of large office buildings one or more building cables should be run vertically in the wire or pipe shafts and terminal boxes provided at each floor, to which can be connected the individual wires for each telephone. The scheme for distributing these individual wires most to be preferred is the hall molding scheme. These hall-molding troughs should connect to the terminal box on each floor so that the wires to each telephone may be run from time to time as needed. This system is cheaper to install and easier to maintain than the conduit system following electric light practice. In many cities there are large area ways under the sidewalks, and a cable run through these area ways from one building to another and provided with a tapping terminal on each property makes a very good form of distribution.

Where the blocks in the vicinity of underground conduit are well built up, but where none of the buildings are large enough or important enough to warrant direct connection, the interior block system may be used to great advantage. In this system one or more underground laterals from the main subway system are run into the interior of the block and terminated on the rear walls of the most substantial buildings. Around the interior walls at a height preferably not over ten feet from the ground are cleated lead-covered dry-core cables. At intervals of 100 to 200 feet a multiple tap is taken to terminal boxes. From these terminal boxes No. 18 B. & S. gauge rubber-covered and braided-bridling wire

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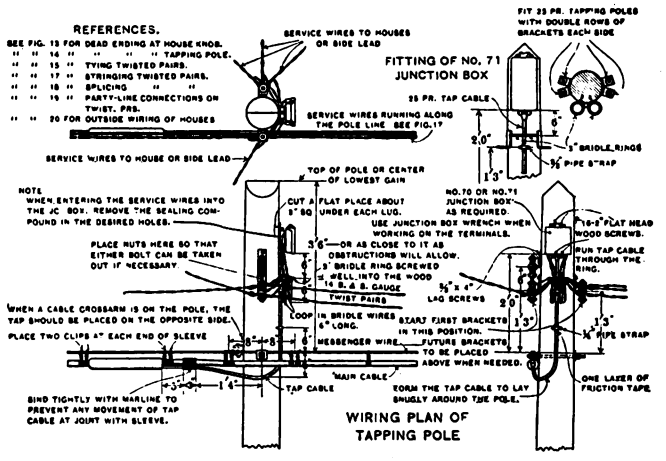
is carried through bridling rings spaced about four feet apart to the various entrances to the subscribers' premises. This distributing cable is, of course, connected to an underground cable from the main subway. In case the number of telephones within the block is small, a terminal box at the end of the underground cable may be sufficient, and nothing but bridling wires through rings used for distribution purposes. Since no protection is needed between the distributing lines and the underground cable, a very neat form of terminal box may be used. In this box the wire terminals are mounted on hard-burned porcelain. A five-foot length of dry-core lead-covered cable is connected to the terminals on porcelain blocks, after which the blocks are firmly seated on a gasket of wicking saturated in compound. The cast iron retaining case is then filled with compound, the cable wiped to a brass nipple, and an air-tight plug inserted in the top. This hermetically seals the terminal. On account of the durable nature of the materials employed in this construction, namely, porcelain, cast iron and brass, the depreciation and maintenance should be very low.

In Figures 1 and 2 are shown examples of interior block distribution. This type of construction is so inconspicuous as to be rarely objectionable, and in consequence its use should be adopted wherever possible. In certain districts in the neighborhood of underground subways the buildings may be very old or may be very widely scattered. In these cases an interior block system could not be installed to advantage, and a low ring-top distributing pole should be used pending the time the block will be sufficiently built up to permit of direct connection or interior block wiring. Figure 3 shows an example of this type of construction. Distributing poles are useful for furnishing connection between the underground system and the subscribers' premises during a period when direct connection or interior block wiring is not warranted. Ultimately it seems certain that the distributing pole is bound to go.

A very large proportion of telephone service must be given in scattered residence districts where the number of circuits is so small as not to justify conduit construction. If conduits were installed at once the construction plant costs would be very materially increased and consequently the cost of service to the subscribers would have to be increased. It is therefore necessary to determine what is the most economical, efficient and sightly form of aerial distribution. In the early days of the telephone it was but natural that the distribution of the telephone wires should follow the same practice adopted by the telegraph companies. Very soon it was found that the number of telephone wires multiplied very rapidly, which required towering poles, equipped sometimes with as many as twenty cross-arms. The invention of the dry core-lead cable furnished relief for these lines, although for many years it was the custom to use as much open wire and as little cable as possible.

In the territory about Pittsburg the topography of the ground is exceedingly rough. This results in winding streets and almost an entire absence of alleys. To construct very large open wire lines in these winding streets was early seen to be impracticable, and when the great expansion of the telephone business began in 1897 it became imperative to design other methods for aerially distributing telephone lines. The system which was finally worked out and decided upon is that known as the aerial cable or all-cable system, which was adopted in 1897 and has been our standard type of aerial construction ever since. In this system very low poles are used, rarely exceeding 30 to 35 feet in height. These distributing lines are placed in alleys if they are available. A cable is strung near the tops of the poles and on alternate poles are placed 10 or 15 pair terminals. Each pair in the distributing cable appears in from two to four terminals, and common pairs are so laid out in adjacent terminals that it is easy to provide for party lines. The multiplying is so arranged that when the cable becomes crowded it may be cut into two or four parts, all pairs appearing in each part, and relieved by feeder cables. No cross-arms or bare wires are used for distribution along the lead, but from the binding posts in the cable terminal a twisted pair, rubber-covered and braided wire is strung directly to a point within the subscriber's premises. The use of this well-insulated twisted pair wire very materially reduces the maintenance. An aerial cable system of this kind with twisted pair wires leading directly to the subscribers' houses is undoubtedly the most sightly form of aerial distribution, since all the cumbersome and troublesome open wires are done away with. In Figures 4 and 5 are shown methods and materials used in aerial cable construction. Attention is called to the grooved insulators used for supporting the twist wires. Each wire of the pair occupies a separate groove, thus preventing a crossing of the wires, which sometimes injures the insulation when there is a heavy strain on the wires.

There has been considerable discussion among engineers regarding the life of a twisted-pair, rubber-covered distributing wire. Rubber and paint are somewhat alike, in that all kinds of mixtures are sold under their names. From the very beginning we have been careful to specify a reasonably high grade of rubber and to insist on making tests of all wire submitted to us, to be sure that our specifications have been complied with. Very good wire was thus obtained, and samples which we now take down after having been in use for seven to nine years still show an insulation resistance of 200 to 400 megohms per mile when submerged in water. If the ordinary type of market wire, which is mainly intended for inside wiring, is used, the life will be much shorter. A good quality of rubber distributing wire well protected with a heavy braid should prove serviceable for ten or fifteen years.


REFERENCES.
SEE FIG. 13 FOR DEAD ENDING AT HOUSE KNOB.
" " 14 " " " " TAPPING POLE.
" " 15 " TYING TWISTED PAIRS.
" " 17 " SYPHONING TWISTED PAIRS.
" " 18 " SPLICING " "
" " 19 " PARTY-LINE CONNECTIONS ON TWIST. PRS.
" " 20 FOR OUTSIDE WIRING OF HOUSES
SERVICE WIRES TO HOUSES OR SIDE LEAD
FITTING OF NO. 71 JUNCTION BOX
25 PR. TAP CABLE
SERVICE WIRES RUNNING ALONG THE POLE LINE SEE FIG. 17
SERVICE WIRES TO HOUSE OR SIDE LEAD
TOP OF POLE OR CENTER OF LOWEST GAIN
NOTE
WHEN ENTERING THE SERVICE WIRES INTO THE JC. BOX, REMOVE THE SEALING COMPOUND IN THE DESIRED HOLES.
CUT A FLAT PLACE ABOUT 5" SQ. UNDER EACH LUG.
NO. 70 OR NO. 71 JUNCTION BOX AS REQUIRED.
USE JUNCTION BOX WRENCH WHEN WORKING ON THE TERMINALS.
PLACE NUTS HERE SO THAT EITHER BOLT CAN BE TAKEN OUT IF NECESSARY.
OR AS CLOSE TO IT AS OBSTRUCTIONS WILL ALLOW.
2" BRIDLE RING SCREWED 1½" WELL INTO THE WOOD
14 B. & S. GAUGE TWIST PAIRS
LOOP IN BRIDLE WIRES 6" LONG.
WHEN A CABLE CROSSARM IS ON THE POLE, THE TAP SHOULD BE PLACED ON THE OPPOSITE SIDE.
PLACE TWO CLIPS AT EACH END OF SLEEVE
MESSENGER WIRE
FUTURE BRACKETS TO BE PLACED ABOVE WHEN NEEDED.
MAIN CABLE
TAP CABLE
BIND TIGHTLY WITH MARLINE TO PREVENT ANY MOVEMENT OF TAP CABLE AT JOINT WITH SLEEVE.
FORM THE TAP CABLE TO LAY SNUGLY AROUND THE POLE.
WIRING PLAN OF TAPPING POLE
FIT 25 PR. TAPPING POLES WITH DOUBLE ROWS OF BRACKETS EACH SIDE
2.0"
6"
3" BRIDLE RINGS
½" PIPE STRAP
1'3"
16-8" FLAT HEAD WOOD SCREWS.
RUN TAP CABLE THROUGH THE RING.
5/8" x 4" LAG SCREWS
START FIRST BRACKETS IN THIS POSITION.
ONE LAYER OF FRICTION TAPE
Figure 4. Details of Construction at Branch Terminal Pole.

Until recently the type of distributing wire most generally used was made of No. 14 B. & S. gauge copper. This size wire was not necessary for conductivity, for as a rule it was connected to a 22 or 19-gauge cable pair. This size of wire was required for mechanical strength, because the wire was strung in spans and had to be self-supporting. During the past year there has been put on the market a copper-clad steel wire which is made by a new method. Copper is welded to a steel ingot and the

copper and steel drawn out uniformly together. From all the examinations we have been able to make it seems that there is a perfect union between the copper and the steel. A No. 17 B. & S. gauge copper-clad wire having 30 per cent conductivity of copper has the same tensile strength as a No. 14 B. & S. hard-drawn copper wire. This reduces the amount of material in the distributing wire one half, and what is still more important, on account of the reduced area, decreases the amount of expensive rubber compound required to surround the wire. The amount of braided covering is also materially reduced. The finished wire is very light and easy to handle and costs approximately 30 per cent less than the No. 14 B. & S. type of wire.

At first sight it seems that a terminal on alternate poles must be expensive, and that terminals farther apart and with intervening distribution made by bare wire,

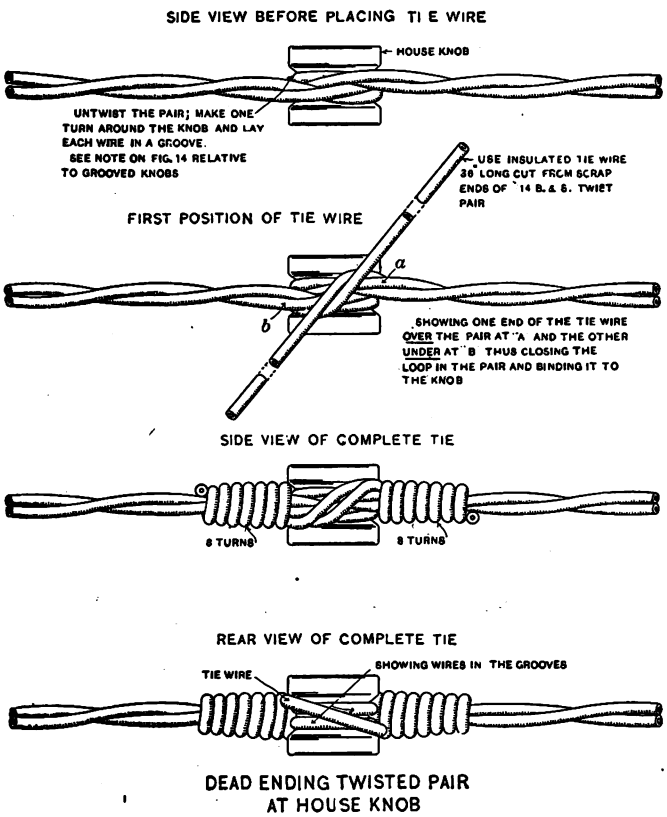

SIDE VIEW BEFORE PLACING TI E WIRE
HOUSE KNOB
UNTWIST THE PAIR; MAKE ONE TURN AROUND THE KNOB AND LAY EACH WIRE IN A GROOVE. SEE NOTE ON FIG. 14 RELATIVE TO GROOVED KNOBS
USE INSULATED TIE WIRE 30" LONG CUT FROM SCRAP ENDS OF 14 B. & S. TWIST PAIR
FIRST POSITION OF TIE WIRE
a
b
SHOWING ONE END OF THE TIE WIRE OVER THE PAIR AT "A" AND THE OTHER UNDER AT "B" THUS CLOSING THE LOOP IN THE PAIR AND BINDING IT TO THE KNOB
SIDE VIEW OF COMPLETE TIE
8 TURNS
8 TURNS
REAR VIEW OF COMPLETE TIE
TIE WIRE
SHOWING WIRES IN THE GROOVES
DEAD ENDING TWISTED PAIR AT HOUSE KNOB

Figure 5. Method of Tying Twisted Pair Insulated Wires to Porcelain Knobs.

would be cheaper. In order to determine this point clearly, a study was made some time ago showing a comparison between aerial cable distribution with taps on alternate poles and with twisted pair direct to the houses, as compared with aerial cable supplemented with bare-wire distribution. Various densities of telephone distribution were assumed, and it was found that in nearly all cases the system with taps on alternate poles was not only cheapest in first cost but also in annual charges. Where the distribution was very dense it was found that a tap on every pole was the most economical. As a general principle it would seem that we should carry the telephone circuits just as far as possible in cable and make the subscriber's drop of minimum length.

There will, of course, be many streets and districts where for the present time aerial cable is not warranted. If these districts are in the neighborhood of an aerial cable base line, and the subscribers are not located more than 1,000 feet away from the cable line, it is economy to connect them with twisted pair wire strung on distributing brackets rather than to resort to the use of bare wire and cross-arms, where perhaps a large part of the arm capacity will lie idle for several years. This method of wiring is shown in Figure 6. If the side streets are clear of trees and it appears probable that many of the circuits will be more than 1,000 feet long, the distribution should be made by means of bare wire on cross-arms, as shown in Figure 7. Generally speaking, the bare wire

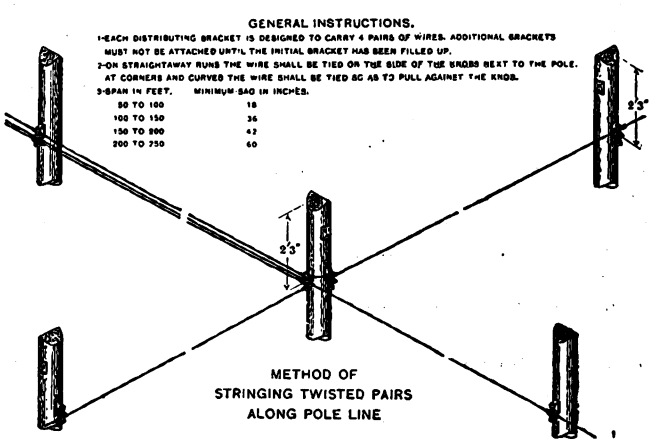

GENERAL INSTRUCTIONS.
1-EACH DISTRIBUTING BRACKET IS DESIGNED TO CARRY 4 PAIRS OF WIRES. ADDITIONAL BRACKETS MUST NOT BE ATTACHED UNTIL THE INITIAL BRACKET HAS BEEN FILLED UP.
2-ON STRAIGHTAWAY RUNS THE WIRE SHALL BE TIED ON THE SIDE OF THE KNOBS NEXT TO THE POLE. AT CORNERS AND CURVES THE WIRE SHALL BE TIED SO AS TO PULL AGAINST THE KNOB.
3-SPAN IN FEET. MINIMUM SAG IN INCHES.
50 TO 100 18
100 TO 150 36
150 TO 200 42
200 TO 250 60
2'3"
2'3"
METHOD OF STRINGING TWISTED PAIRS ALONG POLE LINE

Figure 6. Method of Stringing Twisted Pair Wires Along a Pole Lead.

on these side lines should be of copper, for at the present time, with so much sulphurous smoke in the atmosphere of our cities and towns, the life of iron wire is too short to give the wire serious consideration. Copper wire smaller than No. 14 N. B. S. or No. 12 B. & S. gauge cannot safely be used in spans because of its low tensile strength. This size of wire is not required for conductivity, since in the places where this wire is usually strung we would be satisfied with a cable conductor of 19 or 22 gauge. Here again it also seems possible to make considerable saving by the use of copper-clad steel wire. A No. 14 B. & S. or No. 16 N. B. S. copper-

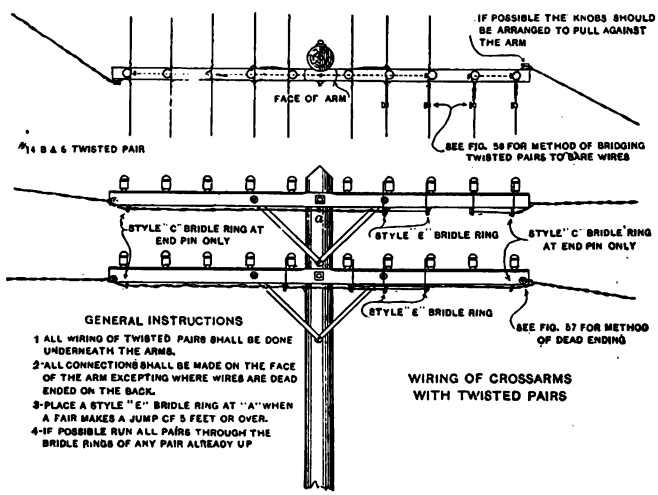

IF POSSIBLE THE KNOBS SHOULD BE ARRANGED TO PULL AGAINST THE ARM
FACE OF ARM
14 B & S TWISTED PAIR
SEE FIG. 58 FOR METHOD OF BRIDGING TWISTED PAIRS TO BARE WIRES
STYLE "C" BRIDLE RING AT END PIN ONLY
STYLE "E" BRIDLE RING
STYLE "C" BRIDLE RING AT END PIN ONLY
STYLE "E" BRIDLE RING
SEE FIG. 57 FOR METHOD OF DEAD ENDING
GENERAL INSTRUCTIONS
1-ALL WIRING OF TWISTED PAIRS SHALL BE DONE UNDERNEATH THE ARMS.
2-ALL CONNECTIONS SHALL BE MADE ON THE FACE OF THE ARM EXCEPTING WHERE WIRES ARE DEAD ENDED ON THE BACK.
3-PLACE A STYLE "E" BRIDLE RING AT "A" WHEN A PAIR MAKES A JUMP OF 5 FEET OR OVER.
4-IF POSSIBLE RUN ALL PAIRS THROUGH THE BRIDLE RINGS OF ANY PAIR ALREADY UP
WIRING OF CROSSARMS WITH TWISTED PAIRS

Figure 7. Distribution of Subscriber's Lines by Means of Open Wire on Cross-arms. Twisted Pair Drops to Subscriber's Premises.

clad wire is sufficiently strong mechanically and has a conductivity equivalent to a 19-gauge cable pair. This will reduce the first cost of line wire about one-half. The copper-clad wire will be just as durable as copper, and since its strength lies on the inside rather than in the hardened outside shell, it will be subject to a lesser number of breaks, and besides it can be taken down and used in other places. It is usually necessary to scrap copper

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wire when taken down, for as a rule it will not stand restringing in another location without causing much trouble from breaking, due to nicked and scratched spots.

When the open-wire subscribers' circuits fills several cross-arms it is generally economical to replace them with a cable. From studies which we have made it has been found that when a cable is placed on a lead of this character it is economy to remove the open wires and cross-arms and return them to stock rather than attempt to use them for distribution from taps placed one to two blocks apart on the cable. The removing of open wires when the cable is placed cleans up the line in good shape, makes it easy to maintain, and far more sightly to the public. It would seem that the aerial cable system of distribution of telephone lines is the most ideal system now known for districts where for the present conduits are not justified. Practically all the large telephone companies have realized the economies to be obtained by its use, and during the last three years thousands of miles of this kind of cable distribution have been placed.

Since the wire plant requires the major portion of the money expended for a telephone system, and since there are so many varied and complex factors entering into its design, the greatest care should be given to its engineering. The most important problems in connection with the wire plant are:

1. The development plans, which must be carefully worked out by the engineer so that not only the first cost of the plant will be a minimum, but so that the plant can take care of increases in business from time to time without unnecessarily large expenditures for redesign and reconstruction.
2. The transmission must be carefully studied so that there will be a good volume of talk between any two connected subscribers. The circuits, whether in cable or in open wire, should sion is sufficiently good it will not be given over unnecessarily expensive trunk lines.
3. The underground system must be extended as rapidly as it is economical to do so, and direct terminal or interior block connections made with the maximum number of subscribers.
4. In the outlying districts where pole lines will still be resorted to, every effort must be made so to design and construct these lines as to have them of low first cost and annual charges. They must be but slightly affected by the elements and free from interference from electric light and power circuits. These aerial systems must be made sightly to avoid the criticisms of the public.
5. The engineer must constantly seek for new and improved types of material and construction methods to be used in the wire plant so that the first cost and maintenance can be reduced.

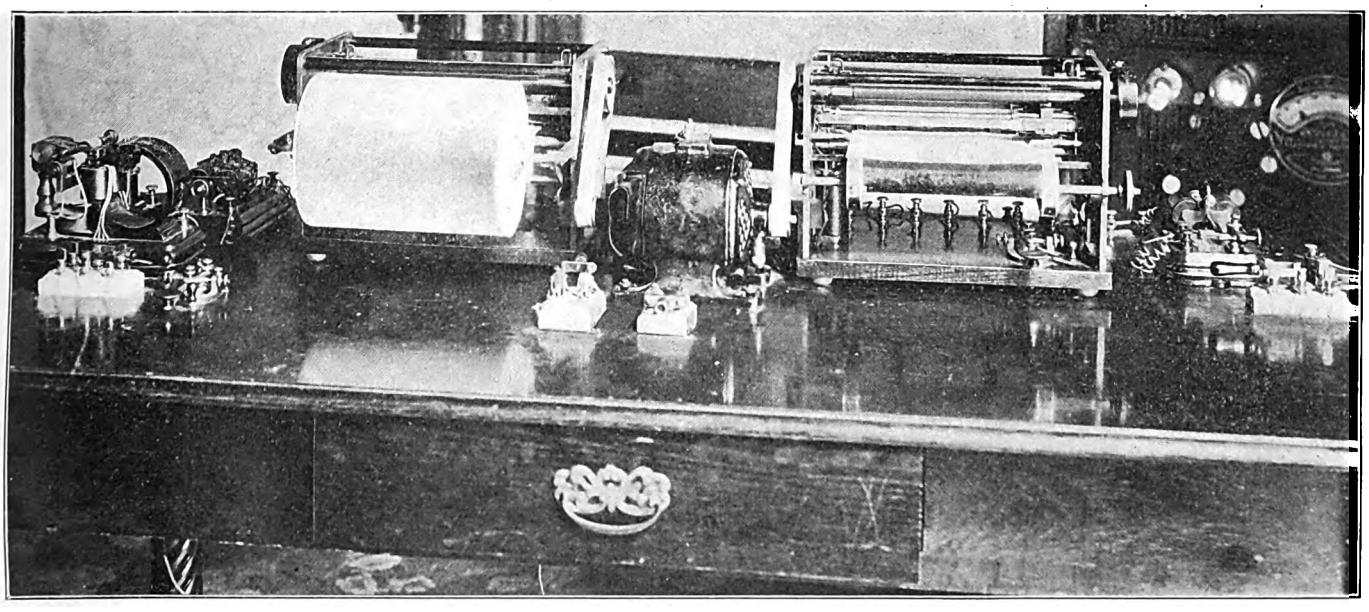
Dean Rapid Telegraph System

By W. H. Mendenhall

THE latest achievement in electric science is the Dean automatic page printing telegraph invented by Robert L. Dean, of Kansas City, Mo. Mr. Dean is an electrical engineer of national reputation, and is an authority on applied science.

His telegraph system is unlike all other automatic systems, and the basic principle is radical. The message is not transmitted from a perforated tape nor received on a tape, but is prepared in page form with an ordinary typewriter, using special type with dots and dashes above and below each letter. The dots are so arranged that positive and negative impulses are sent over the wire when desired. The alternating current is not used, but a three wire motor generator is employed with the positive of one side and negative of the other side connected to the two styluses which alternates the current when needed.

The Hammond typewriter is employed in preparing letter telegrams. Instead of perforating the sheet, it is embossed and typewritten at the same time. If a mistake is made, it is not necessary to re-write letter to correct error, the operator erases the embosses and rewrites the word in which the mistake has occurred. This enables the operator to prepare about fifty words per minute. After the letter is prepared for automatic transmission, it is fed through a transmitting instrument at a speed of from 300 to 500 words per minute, and received at receiving station in plain gothic letters in



Receiver. Transmitter.

Front View of the Dean Rapid Telegraph System.

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page form. In the sending instrument two styluses are used to send positive and negative signals. The styluses are made of sapphire—ground to a certain angle suitable for the work which passes over the embosses and closes the metallic circuit.

While the emboss which the stylus passes over is small and delicate, yet it does its work perfectly and the speed that is attained is marvelous.

The general construction of the receiving instrument is the same as the sending instrument, with the exception that it has a "printer" instead of a stylus. The "printer" consists of two characters, with which the entire alphabet is formed, or produced. One character is actuated by the positive impulse, and the other character is actuated by the negative impulse. A polar-relay of special design, having two armatures is employed. One armature controls one character, and the other amature controls the other character, which is used in forming the letters. Since there are only two

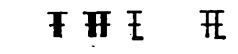
Robert L. Dean.

characters to produce the entire alphabet, it requires an alternation and in some cases two alternations to form a letter. As it only requires one or two alternations to produce a letter, from 300 to 500 per minute can be attained under the most unfavorable conditions.

The Dean telegraph is perfected and has been tested, and is now doing commercial work between Kansas City and St. Louis on a phantom circuit, a distance of 320 miles. The system was operated on a

As Prepared by Typewriter Ready for Transmission.

phantom circuit between Kansas City and Joplin, Mo., for one month, and the splendid work done was beyond the most sanguine expectation. Hundreds of letters and telegrams are being handled daily for representative business men of Kansas City and St. Louis, and the numerous endorsements Mr. Dean is receiving daily, bespeaks most flatteringly for the splendid work his system is doing. Conservative business men who have used the service, claim that Mr. Dean will prove himself to be as great a benefactor to the twentieth century as Prof. Morse did to the nineteenth century. Mr. Dean has devoted the greater part of his life to



As Produced in Page Form by Receiving Instrument.

scientific work, and has made a special study of the telegraph. He is a strong advocate of the underground system, and claims that nothing else will meet the demands of the present age.

Telephone Manners.

If there's one thing most maddening of all in this tinkle telephone world it is picking up the receiver to hear in a peremptory tone "Who is this?" At this impertinence every fighting microbe in the system bristles up. It levies hard upon the average person's manners to confess meekly the name he bears and solicitously inquire how it may be his honor to serve the unknown person on the other end of the line.

Another heinous telephone offense, of which most of us are the occasional victims, is to be called up by the stenographer or clerk of the busy man and compelled patiently to keep the connection until the gentleman is ready to talk to us. Not infrequently it happens that the person called is the one of whom the favor is asked. But the petitioner for favor calmly encroaches upon our time and disposition as if both of those commodities were kept in stock for his particular benefit.

Manifestly whatever inconvenience attaches to a telephone conversation should be borne by the person who does the calling, not the person who is called. But the point, unhappily, is ignored by many.

But the individual who opens the dialogue by insisting upon knowing "who you are" before revealing his own identity is the most impossible creature in the telephone category. Seemingly it would be just as easy to inquire if Mr. Soandso—whom he wishes to talk to—is in the office; or to say, "This is Mr. Blank; I wish to talk to Mr. Whateverishisname." If not so easy, at least it would be decidedly better manners.

Against the busy man who gets you to the telephone by stenographer or clerk there is some defense. It is possible to hang up the receiver and resume one's work until the thief of time at the other end comes to the telephone himself and awaits your convenience. But against the abrupt "Who is this?" there is no defense, though in the broad-gauged soul, perhaps, there is an element of pity leavening the disgust.—Joplin (Mo.) *Globe*.

This Man got Right.

Theodore Gary, manager of the Macon county telephone system, Macon, Missouri, received a letter inclosing $1 as restitution from a person near College Mound who, six years ago, playfully shot an insulator from one of the company's poles.

"I have obtained salvation," writes the man, "and I'm going to make good with everybody I wronged while in darkness. I not only request a letter acknowledging monetary satisfaction, but your complete forgiveness. In the old days I thought it smart to stand off as far as I could see and smash your insulator with a rifle ball, but things look different now, and I'm going to do as I would be done by."

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Some Questions Answered

By Arthur Bessey Smith

Instructor of Telephone Engineering, Purdue University.

Editor SOUND WAVES: Will you please tell me through your valuable paper the nature of a "long line" relay. I have heard such a thing mentioned but cannot make out its application. Also if you can show by a drawing how it is wired up it will greatly oblige.

The "long line" relay to which the correspondent refers is a device used by some people to help the signalling on a long line. Some of the older switchboards used in common battery work were not equipped with as sensitive relays as are now made for regular work. Consequently, it occasionally happened that some subscriber's line was too long to work the line and supervisory relays with the best of satisfaction. In these cases an additional relay was put in to throw a bridged impedance coil across the line. This would draw enough

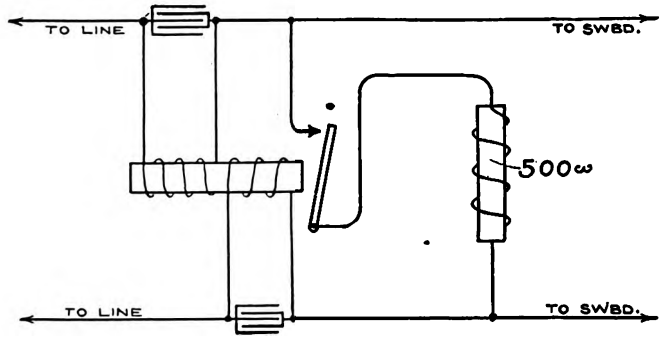

Figure 1.

current from the office equipment to make the line relay pull up. Figure 1 shows a typical arrangement. *L L R* is the long line relay, the two coils of which are connected in each side of the line. The condensers allow the talking current (alternating) to pass around the windings without suffering appreciable loss. *C* is the impedance coil which pulls current from the switchboard and operates the regular relays. It is made inductive so as not to form a leak to the talking current. In modern switchboards it is hardly necessary to resort to this device, as the regular relays are dependable as far as it is wise to carry the subscriber lines.

Editor SOUND WAVES: How bad a ground does it require to make a metallic circuit noisy? We have had some discussion on this point, one person saying that the slightest ground will do it. We have one line which had a dead ground on it for two weeks before it was discovered, yet it was very quiet except at times. How can this be?

The question of leaky lines and noise is one which is ever present with those who are cutting over from grounded lines to metallic. It is also one which has not as yet received attention to find out its laws with exactness. However, some of the laws are known in a way, even if not stated mathematically. A short line, if not connected through the switchboard to a long line, may often be very quiet even if the ground be of negligible resistance. This is especially true in rural districts, and where there are few or no power lines to cause disturbance. Under these favorable conditions the line may be of considerable length without becoming noisy when grounded. But if the line runs through a region which is infested with trolley lines, motor circuits, and high tension lines, the slightest ground may cause bad noise. The longer the line, the worse is the trouble. I remember one case of noise on a long toll line, in which the line was so noisy as not to be commercial. When traced up and found, it proved to be against a cottonwood tree. It was in the spring, and the wire had rubbed its way through the outer bark and was resting in the soft, inner layer. If your short line with a ground on it is attached to a long line, without the use of a repeating coil, it is easily seen that this makes a ground on the long line. So both of them will be noisy as long as the connection is up. This often accounts for a line being noisy at times.

Another case of noisy line which came to my notice is a subscriber circuit which ran for two or three spans on the same poles with an arc light circuit. It was noisy only at night, when the arc circuit was running. Twisted pair was substituted for open wire, yet the noise was not very much improved. On a test, the line was cut off from the switchboard and tested out with a local battery set, keeping the office end insulated from the earth. The line was quiet. When put back on the switchboard, it was noisy as before. The insulation of the line was perfect. The trouble was located in the switchboard, due to an unbalanced condition of the relays feeding battery current to the cord and line for talking purposes. The impedance from one wire to earth was not the same as the impedance from the other wire to earth. If they had been equal, there would have been no noise.

To sum it all, the amount of ground to make a metallic circuit noisy depends on the length of line, and the "exposure," *i. e.*, the intensity of disturbing influences, and the balance of the central office equipment, in the case of common battery.

Editor SOUND WAVES: How do you explain the fact that talking into a telephone receiver generates an electric current?

To make the explanation clearer, let us refer to Figure 2. In this the elements of the receiver are shown without the shell. The permanent magnet, *N S*, has attached to it the pole pieces which carry the coils. These coils are connected to each other and to the lines in such a manner that if current were to enter at L_2 it would tend to magnetize the iron in the same direction as that produced by the steel magnet. The broken line shows the position which would be occupied by the diaphragm if it were not acted on by the magnet. The solid line, *B*, is its real position, being slightly "dished" by the pull of the magnet, *N S*. It is one of the principles of electromagnetism that any increase in the intensity of magnetism (lines of force) in a coil will create a voltage in the coil opposite to the current which would produce that magnetism. This voltage lasts only while the lines of force are changing. Its intensity is proportional to the rapidity with which the lines of force change. Also, when the intensity of magnetism in the coil decreases, the reverse is true. That is, the voltage created will be in the same direction as that of the current which would produce that magnetism.

When the voice waves in air strike the receiver diaphragm, they make it vibrate in unison. Thus it periodically approaches nearer to the pole pieces and then recedes from them. As it approaches, it shortens the air

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gap, thus making the magnetism stronger. This induces a voltage in the coil which will tend to send a current out at L_2. When the diaphragm moves away from the pole pieces, it lengthens the air gap, thus weakening the magnetism. This creates the voltage in the coil tending to send a current out at L_1. This makes it clear that the

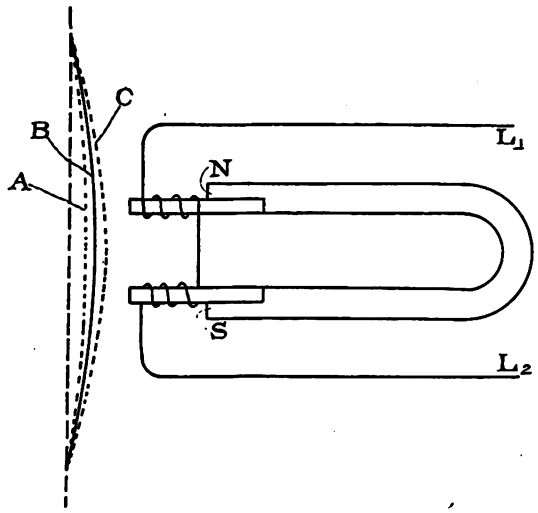

Figure 2.

voltage produced will be alternating, also that if a receiver be attached to the wires, the current flowing as the result of this alternating voltage will also be alternating. All the characteristics of the sound wave in air are reproduced in the current, which is necessary to the reproduction of speech.

Editor SOUND WAVES: Is it possible to transpose parallel grounded farm lines so as to equalize the induction? That is, so that Nos. 1 and 2 will not cause any greater trouble by cross talk than Nos. 1 and 10, by transposing 1 and 10, etc.

It is possible to mix up the lines as you suggest, by a careful consideration of all the lines and conditions from one end of the lead to the other. Usually the most of the lines will keep together for a considerable distance from the office. Consider this distance first and mix up the lines in it. The plan shown in Figure 3 is

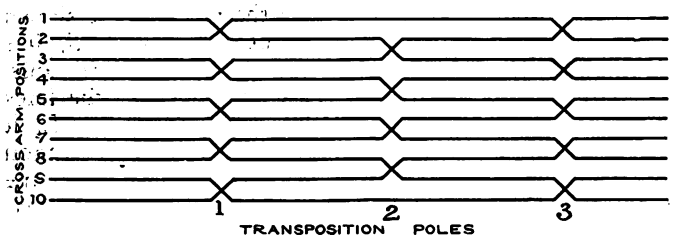

Figure 3.

about the simplest for the purpose. The essence of the scheme consists in transposing the wires as pairs at the odd numbered transposition poles. That is, at transposition poles 1, 3, 5, etc., you would transpose positions 1 and 2, 3 and 4, 5 and 6, 7 and 8, 9 and 10. At the even numbered poles let the outside wires go straight and transpose the rest as pairs. So at poles 2, 4, 6, etc., you would transpose 2 and 3, 4 and 5, 6 and 7, 8 and 9. Positions 1 and 10 would go straight through. By this manner of transposition, each wire is adjacent to each other wire for only 2-10 of the distance covered by ten transposition sections. The same plan is easily applied to 6-pin and 10-pin cross arms.

If you go into this matter, it will mix up your trouble men very much unless you adopt some scheme of numbering so that they can tell what each wire is without having followed it all the way from the office.

Editor SOUND WAVES: What is a "make-before-break" relay? Where are they used?

The make-before-break relay is one of a class of special relays which are used only where the order of action of the contact points is essential. Figure 4 is the representation of such a relay and shows the essential principle involved. *M* is the mainspring, which is the spring that makes contact with two other points. *B* is the back contact, normally touching the mainspring. *F* is the front contact and is controlled by the armature of the relay. When the coil is energized, the armature pulls *F* up till it presses against *M*. Further motion on the part of *F* carries *M* along with it, breaking the back contact, *B*. Another form is shown in Figure 5. The springs are lettered the same as in Figure 4, and act in essentially the same manner. The armature, *A*, is pulled by the magnetic force of the coil in the direction indicated by the arrow near the bottom. This raises the upper end of the armature, under the front spring, *F*, as

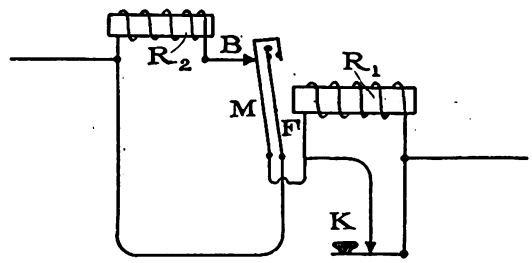

Figure 4.

shown by the arrow. In moving upward, the front spring bears against the mainspring and carries it away from the back contact.

One of the uses to which this form of relay is put is shown in Figure 4. In this I have shown only the details used in this operation, omitting parts of the practical circuit which are not concerned. Normally R_1 is shunted out of circuit and R_2 is energized. It is desired to bring R_2 into use and cut R_2 out. To do this the key, *K*, is

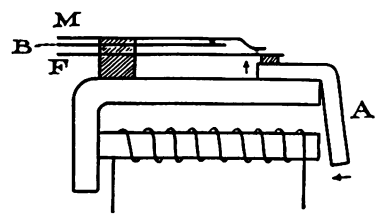

Figure 5.

opened. This takes the short circuit off R_1 which promptly pulls up. In pulling up it first short circuits R_2, then opens the circuit of R_2, thus locking itself in position. If it had opened the circuit of R_2 before closing the path around it, it would have cut off its own current. The result would be a chattering of the armature. As it is, the operation is smooth and certain. There are other ways of making a relay "make before breaking," but the above is the most certain.

Editor SOUND WAVES: I understand that most companies are now using a condenser in series with the receiver in the rural telephones to make it so that the operator can ring on the line when people are "rubbering." Is this the only way in which the evil can be cured? Cannot something less expensive be devised?

As far as I know, the condenser is the best means for the purpose. The conditions are these. We have a circuit across which are connected a number of bells and one or more talking sets. The impedance of the bells is very satisfactory for ringing and talking. The impedance of the talking sets is very satisfactory for talking, but far too low for ringing. They act as a leak across the line. If we wish to ring under this condition, we must put something in series with the talking set which will be very much hindrance to the ringing current to prevent it from leaking across the line. Yet it must offer but little additional impedance to the talking current. The condenser fits the case very well. The reason lies in the relative frequencies of the ringing and talking currents. Ringing current is about 16 cycles per second, while talking current may run from 200 to 1,000 cycles per second. The resistance offered by a condenser to alternating current varies inversely as the frequency, as far as it alone is concerned. The higher the frequency, the more easily the current goes through. Thus the low frequency ringing current finds it difficult to get through, while the talking current receives much less impedance. Some have proposed to put in a non-inductive resistance to keep out the ringing current instead of the condenser. If the resistance of the added coil be made high enough to do any good, it will affect the talking very materially. Non-inductive resistance affects all frequencies alike.

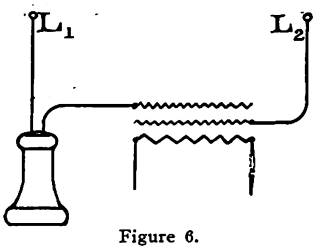

Figure 6.

Others have proposed to wind the secondary of the induction coil in two parts, as shown in Figure 6. This will work to some extent, as it depends on the capacity, or condenser effect between the two windings. Since this capacity is quite low, it is not as good for talking as a one M. F. condenser and the regular coil. The split secondary scheme is cheaper, but not as good as the use of the condenser. I have even used a one-half M. F. condenser with perfectly satisfactory results.

Editor SOUND WAVES: We have had considerable trouble on our switchboard with cross talk between the operators. The trouble comes and goes. Usually it is an "A" operator in this office that gets cross talk from the "B" operator of a branch exchange which we have, but sometimes two of our "A" operators get together with a "B" operator. It is hard for us to locate, for it ceases almost as soon as we commence working or testing on it. If you can give us a clue to the trouble, I shall be very much obliged.

From your description of the trouble I take it that you are using the "call wire," or "order wire" system between offices. I would advise you to look carefully after the order keys. It is very likely that some of them are sticking at times. If an "A" operator calls the "B" operator and the button sticks, they will be left together. If another "A" operator has a call for the same "B" operator, and her key sticks, it will leave all three together. This ought to be very unusual, but would produce the effect to which you refer.

Editor SOUND WAVES: We are about to put electric lights in our telephone office and I am planning on a light in the terminal room. We enter the room through two doors on opposite sides of the room. I want to wire it so that I can turn the light in the center of the room on and off by a switch near each door. It is no fun to stumble around to find a switch somewhere on the opposite wall. How can I wire it to secure the double control?

You will need two 2-way switches and a little extra wire. The rest is not hard. Figure 7 shows the connections. In the condition indicated, the lamp will be out. Snapping either switch will light the lamp, after which either is able to put it out. Further explanation is not necessary. Any supply house can sell you the switches.

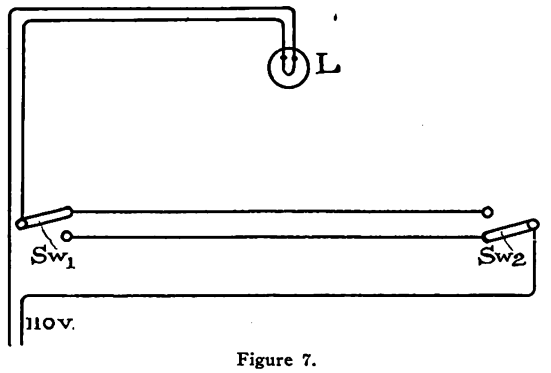

Figure 7.

Editor SOUND WAVES: What is the character of lightning? Is it direct or alternating current?

The exact nature of lightning is somewhat in the dark as yet, notwithstanding its apparent brightness. At first it was thought to be a direct current, that the charge moved from one point to another and when all the electricity was spent the current stopped. Then came along the oscillatory theory. According to this there is a surging of current from one cloud to another, or from a cloud to the earth, gradually decreasing in force till an equilibrium is established. It would be similar to the surgings that occur in a common water trough when the water is displaced from one end to the other. This is a crude illustration, but it helps one to get an idea of the electrical action. Of late years there has been a return on the part of some to the direct current idea. The truth is very likely that both are right. It may be sometimes direct current and sometimes alternating and of enormous frequency. On account of its uncertainty, both as to where it will strike and when, it is exceedingly difficult to get any series of observations to serve as the basis of calculations. In other words, if lightning were to strike a certain spot regularly every day at four o'clock, we could doubtless get some very valuable data, and find out its exact nature. But as it is, we can not so depend upon it. Experiments are often tried with electro-static machines, or with high tension transformers in an attempt to duplicate lightning conditions, but it is not certain that we are getting the same thing.

Editor SOUND WAVES: What is the best way to make a ground on a water or steam pipe? Is it necessary to solder the wire every time?

It is not necessary to solder the ground wire in every case although soldering makes the best job and the most permanent. The most handy device is the ground clamp, of which there are several kinds on the market. Our advertisers can supply a good grade of ground clamp, to whom we refer you. Personally, I have used a ground clamp with the best of success and would not hesitate to install them in large quantities. They are more easily installed than any other manner of grounding, and give the trouble man a good place to

open the ground circuit if he needs to do so in hunting trouble. If the telephone is moved or removed, the clamp can be taken off and used again, so that little of the cost of grounding is lost.

Some people go to the trouble of covering the pipe with tinfoil, after scraping it, winding on several yards of copper wire, lashing it down, covering with another layer of tinfoil and closing with a few layers of friction tape. Of course there is a very good ground. Personally I think it is too much bother. The time of the installer is offset by the cost of the clamp. The completed job can not be removed, but is a dead loss if a change is made.

In any case where a ground is made on pipes of any kind you must see to it that the pipe surface is clean. This may necessitate a little filing, if it is black pipe, or only a little scraping in the case of galvanized pipe.

Just because it is a pipe is no sign that it is a ground. Most pipes *do* run to the ground, but when you get used to them running to the ground you will go to sleep and run into a case some day which has never seen earth. Make sure for yourself that the pipe has good earth connection before you use it.

Editor Sound Waves: Which is cheaper to use on bell circuits, dry or wet battery? There seems to be quite a movement now to throw away the wet battery entirely and use dry cells. It seems to me that this must be more expensive in the long run. In the case of the dry cell all of it has to be thrown away, while the wet cell can be recharged.

The question of wet cells versus dry cells seems not to be settled as yet with some people and the question of the correspondent comes at a good time. There are still places where the wet cell is appropriate and cheaper than dry cells. The telegraph line, operating as it does on closed circuit, takes such a steady flow of current that it would drain a set of dry cells too quickly. You would not get out of them all the energy which they really possess. It is well known of dry cells that if they are loaded too heavily and made to furnish too strong current for too great a time they will run down in voltage so quickly that they are not economical. In such cases some form of wet cell is proper. But for the majority of uses where only light current is needed and that infrequently, the dry cell is by far the cheaper. I have in mind a case where a fire bell was operated by a weight through cog wheels, the release of which was accomplished by an electro-magnet. It took quite a little current to operate the magnet, but the calls were infrequent so that the battery stood on open circuit for the greater part of the time. Dry cells had been used with success for a long time. One day the man in charge started to cut down expenses. He began on the battery, putting in carbon sal ammoniac cells with the idea that the only recharging they would need was more sal ammoniac and occasionally a new zinc. The battery ran all right for about three months and then refused to operate. He threw away the old solution, made new solution, and cleaned the zincs. But the battery did not pick up. At this time the writer was called in to find the trouble. The solution was suspected. A new solution made of sal ammoniac which was above suspicion was substituted in one of the cells, but it did not help in the least degree. New zinc rods also had no effect. Then a fresh carbon element was put in one cell, upon which it at once came up to full strength. All the old carbons had to be thrown away. The lesson in true economy was quite clear.

Editor Sound Waves: We have a small exchange in which we have considerable trouble with operators who do not attend to business. They talk to subscribers in a way that we do not like, according to the reports of telephone users. Yet we have no means of checking it up, for as long as any of the officers of the company are around, the operator is as good as possible. Is there some way for me to listen in on the operator from my house? My line is a metallic circuit. It is too far to string a line for that purpose and two circuits to my house would excite suspicion. If you can suggest any way to do it, I shall be very much obliged, for it will help us out of a very real difficulty.

The trouble to which you refer is one which may happen in almost any exchange, but is usually peculiar to small ones. Often there is only one operator on duty, and there is no one to supervise her work. I have devised a plan which is shown in Figure 8. The relay at the central office should be at least 500 ohms resistance. Since your system is small, the chances are that the legging of a relay from one side of line to ground will not bring appreciable noise on your line. Put a third winding on the operator's induction coil and connect it

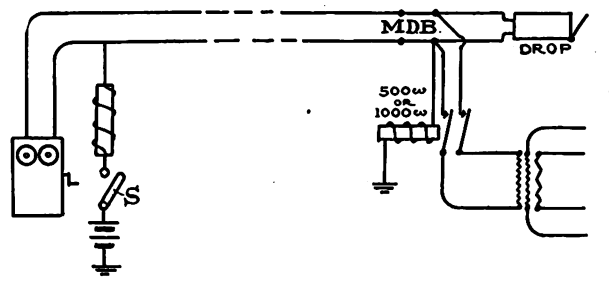

Figure 8.

to the relay as shown. At your house, you will need enough battery (dry cells) to operate the relay with certainty. You will also need to put in the battery circuit of your telephone a switch to cut out your transmitter. To supervise the operator it is only necessary to open your transmitter switch, close the line switch, *S*, take the receiver from the hook and listen. An added precaution will be to see to it that your ringing generator on the switchboard is not grounded, or if it is, have the relay and switch, *S*, on the same side of the line as the ground on the generator.

Editor Sound Waves: We have a number of farm lines on our switchboard which we desire to change from straight-bridged to semi-selective. We are not provided with pulsating current generator, but have one which delivers good, strong alternating current. How can we arrange our circuits so as to ring only half of the bells at once? Must we sell our generator and get a new one?

If your bells are all 1600 ohms, you can arrange them as shown in Figure 9, bridging them from line to ground. Put a permanent ground on one terminal of your generator. Then wire the ringing leads through a

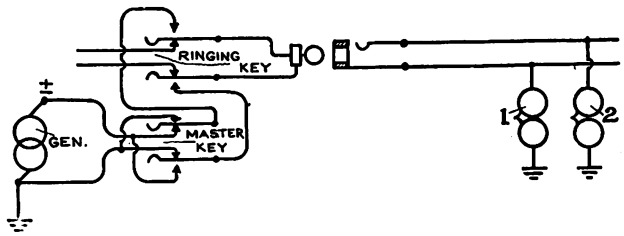

Figure 9.

special master key, which has the ability to reverse the wires. The lever of the master key should lock in position. In the normal position, it will be seen that when you ring, all the bells on the sleeve side of the line are short circuited by the ground on the generator. So only the tip bells will ring. Number 2 is the only tip bell shown in the figure. When the master key is thrown, it

reverses the ringing leads, bringing the ground on the tip side, so that only the sleeve bells will be free to respond. Of course the subscribers cannot ring each other. There may be trouble caused by the farmers ringing for central, if their hand generators are very strong. In this case the current will leave the hand generator, go to the tip wire, flow to earth through all the tip bells, up to line through the sleeve bells, and so back to the generator. There is no question of this action, the only doubt being as to whether the current will be strong enough to move the bells and cause false signals. There are two ways to remedy it. The first is to remove one of the magnets from each of the subscriber's hand generators and thus weaken it so that it cannot cause a false ring. It will still be strong enough to throw the drop at central in good shape. The second is to place 3,000 or 4,000 ohms resistance in series with each bell, and thus make the bell less sensitive. Both these plans have been tried in practice with good results.

Editor SOUND WAVES: In "American Telephone Practice," bv K. B. Miller, the author instructs his readers not to solder joints in splicing cable, and makes it very emphatic. Why should the joints *not* be soldered?

Our correspondent evidently has arrived at a very good rule for his telephone work. He is not satisfied with half-way measures and has found it to his profit to solder all line joints. This is a good rule and very much to be commended. If more managers and superintendents would do more soldering in the right places, there would be far fewer troubles and more satisfied subscribers.

In answering the question it will be well to see what are the conditions in a splice and in an open wire joint. In the first place, the open wire joint is exposed to the action of the air, rain, sunlight, smoke, etc. The joint in the splice is secluded from all of these. When the splice is boiled out with paraffine, it drives out all moisture, a good part of the air, and it is certain that no other gases can gain access. The fact that the boiling point of paraffine is considerably above the boiling point of water is a very happy circumstance for cable work. Since the joint in the cable splice is so carefully shut off from the causes of corrosion, there is little need of adding solder. Again, the two wires in the splice are always of the same material, which is copper. The line jumper is often fastened to a line wire which is made of iron. When the rain water settles into the spaces of the joint, it causes a minute battery to be formed, which eats away the metal with unfailing regularity and certainty. Iron to iron or copper will not corrode even in the atmosphere to the same extent which will be done by a combination of the dissimilar metals. For these reasons, similarity of metals and protection from corroding influences, it is not necessary to solder cable wires in a splice.

An added reason may be found in the likelihood of small pieces of solder being dropped into the splice. These may lodge between the wires and later on may cause crosses.

Design in Automatic Exchanges

By David S. Hulfish

IN the design of an automatic telephone exchange, the thought of first importance is to accomplish the required results with a minimum of apparatus. As the exchange becomes larger, this feature of design becomes more and more important.

In the design of the Strowger system, as most widely used today, the switching unit is a device called "selector" or "connector," according to its location in the system, but being substantially the same switching unit wherever located. It is a device for connecting one talking pair to any one of a hundred other talking pairs, the first pair appearing in movable brushes or "wipers" and the hundred pairs appearing in fixed or "waiting" contacts over which the wipers may be moved; the wipers are capable of being moved to any position and stopped in electrical connection with any desired pair in the array of fixed contacts constituting the ends of the hundred "waiting" circuits. The method now generally used for installing these Strowger switches is to install one switch for each subscriber's line, the line being connected to the wipers, and trunks being multiplied into the waiting contacts so that the subscriber on that line may move his wipers into electrical connection with a trunk which runs to another similar switching device in which can be found the line of the subscriber with whom he wishes to talk. The method of setting up a connection, therefore, consists of the subscriber moving his own individual wipers into connection with such a trunk as the telephone directory indicates, and then over that trunk moving its wipers at its distant end into connection with the particular line which he desires. All of this may be done by a Strowger substation calling device. It will be noted that each line must have a switching unit, called a selector because it selects a trunk, and that each trunk must have a similar switching unit, called a connector because it connects with the desired line and completes the final step of the circuit. The total number of switching units required is one for each line plus one for each trunk, and where there are a large number of trunks, as in a 10,000 line exchange, this number amounts to about 120 connecting switches for each 100 lines.

A similar thing in manual switches would be to end each line on a plug which the operator then could place in a trunk jack, if trunking were necessary, the trunk ending in a plug which then could be placed directly in the line jack of the subscriber to be called. This design of manual switchboard, paralleling exactly the general Strowger practice, actually was designed, installed, operated, found inefficient, condemned and forgotten, being replaced by more economical and efficient methods.

The single-plug method of switching subscriber's lines was displaced by the plug-pair method, wherein any connecting plug could be attached to any calling subscriber's line by means of an answering plug which was inserted into the answering jack of the calling line. This greatly reduced the number of plugs. Following the thought of analogy between the manual switchboard and the Strowger switches, each Strowger switch wiper is a connecting plug and its fixed contacts are jacks for the plug. Two such switches with their wipers connected together would be an analogy for the cord pair where the answering plug may connect with any answering jack, and the calling plug with any trunk jack, the trunk then ending in a plug which may connect with any of a group of line jacks. Such a pair of Strowger switches would have on the fixed contacts of

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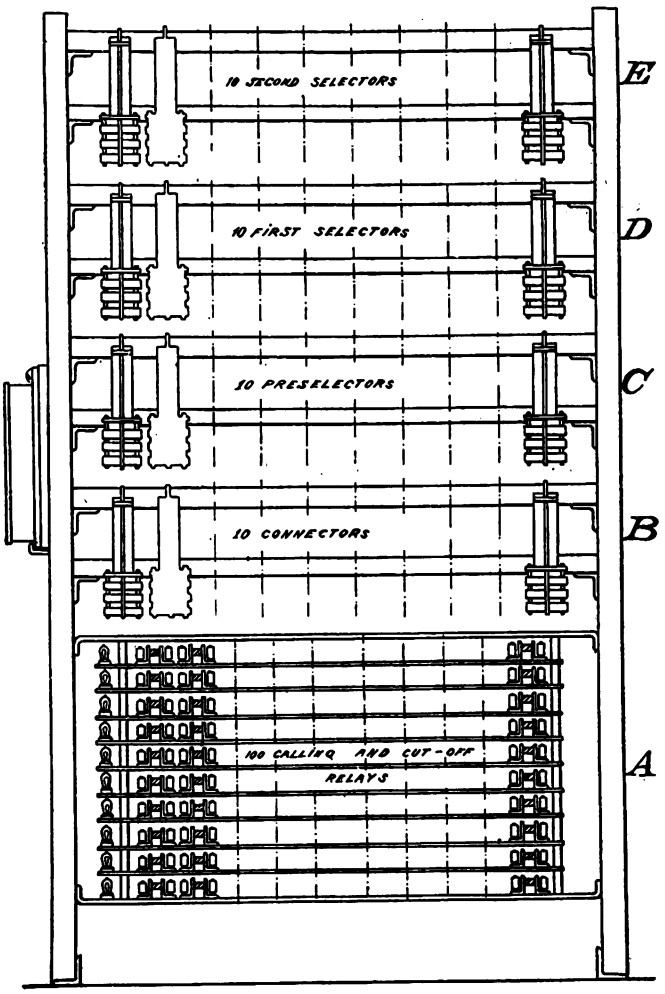
one switch lines whose calls are to be answered, and would have on the fixed contacts of the other switch trunks which might be selected by control of the line answered; then by further control by the line answered the switch on the distant end of the trunk picked out could connect with the line desired. The economy in expense of switching units is apparent at once. An operator handles 100 lines with 10 cord pairs. An automatic switchboard answering 100 lines would require but 10 pairs of switches or 20 switches in all, instead of 100 switches, one for each line as at present. The trunks would require a switch per trunk as before. In an exchange of 10,000 lines the equipment under the plan generally used now is 10,000 line switches and 2,000 trunk switches,—12,000 switches in all. Under



the proposed plug-pair plan the same exchange would require 2,000 trunk switches and 2,000 cord pair switches,—4,000 switches in all, thus showing a saving of two-thirds of the total number of switches required. This computation is based upon ten cord pairs for each 100 lines, a ratio which is amply high, as observation has shown. The efficiency of the two plants would be the same.

The principal problem lies in the control of the automatic "answering plug" switch to cause it to connect promptly and automatically with a calling line before that line begins to send impulses for control of the selector or connector switches, to remain unresponsive to such control impulses and to disconnect when conversation has finished. This problem is not an impossible one, and when properly solved by that inventive genius with which our fair land abounds will enable present Strowger automatic exchanges to extend their list of subscribers greatly without purchase of additional switching units, and will enable new automatic exchanges to be installed at a very much lower cost than heretofore has been possible.

One solution of this problem is presented in the current U. S. Patent No. 853,818, issued May 14, 1907, to Frederick Merk, of Berlin, Germany. Mr. Merk is an engineer connected with the Deutche Waffen und Munitions Fabriken, a German company making electrical apparatus, etc. The accompanying illustration is taken from Mr. Merk's patent and shows a complete equipment for 100 lines in a 10,000 line exchange. At *A* are 100 calling and cut-off relays, as in a relay multiple switchboard. At *B* are 10 connecting switches corresponding to incoming trunk plugs. At *C* are 10 answering-plug switches for the 10 plug pairs of the 100 lines. At *D* are the 10 calling plug switches for the 10 plug pairs of the 100 lines. At *E* are 10 trunking switches. When a line calls it operates its line relay and immediately is answered by one of the *C* switches; in response to the subscriber's dial the *D* switch of the pair selects the trunk just as though that *D* switch were directly connected to the subscriber's line, as has been the custom in the past in installing Stowger switches. The rack in the illustration mounts 40 Strowger switches, which is the full equipment for 100 lines and all necessary trunks.

Weather Forecasts by Telephone.

An important feature of the service given by the Weather Bureau of the United States Department of Agriculture is the distribution of weather forecasts by telephone. The telephone affords an effective means of disseminating weather information, not only in rural districts, where the mails are infrequent, but also in the great centers of population, and next to the newspaper is considered the most valuable ally of the Bureau. In 1904 the number of forecasts distributed in this manner in the United States was about 150,000. At the present time the forecasts are available to more than one million telephone subscribers. The service is performed by the telegraphing of the daily forecasts from the central Weather Bureau office to the managers of telephone exchanges. The information is then given to the operators, who, in turn, repeat it to any subscribers connected with the exchange that calls "central." The large number of telephone companies that co-operate with the Weather Bureau in this important work attests to the fact that telephone officials recognize the benefits resulting from placing the forecasts at the disposal of their patrons.

During the crop season the forecasts are of exceptional value to farmers, who, by means of the many rural lines, can secure information of coming weather changes within less than two hours after its issue by the official Weather Bureau forecasters.

Mackay Controls Bell Companies.

The Mackay Companies, which is an original organization and not a consolidation, has just listed its holdings with the New York Stock Exchange. From this listing it appears that the Mackay combination owns the whole or part of the stock of 102 cable, telephone and telegraph companies. It is the largest holder of stock in the American Telephone and Telegraph Company, and controls a number of subsidiary Bell companies. It holds more or less stock in all of them. The only Independent telephone companies in which the Mackay concern is said to be involved are the Citizens' Telephone Company, Grand Rapids, Michigan, and the Home Telephone Company, Kansas City, Missouri.

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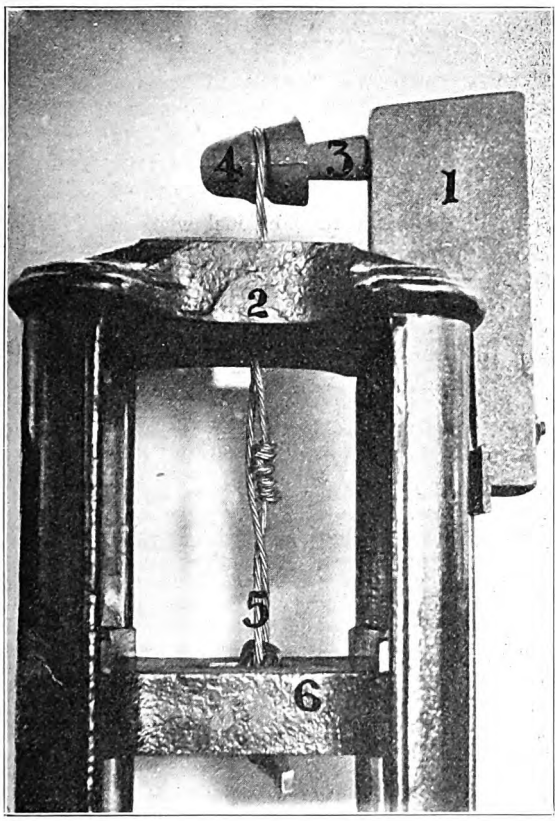
Strength of Insulator Pins

AT the request of certain consumers, the Forest Service of the United States Department of Agriculture recently made tests on fifty-three insulator pins of rock elm, live oak and black locust. The tests were made at the timber-testing station of the Forest Service at Purdue University, Lafayette, Indiana. The results indicate the relative strength of the pins tested. They depend upon too small a number of tests, however, to show in an authoritative way the relative value of these woods.

The pins were of standard size, one and one-quarter inches by eight inches. The oak pins were from one-eighth to one-quarter inch shorter than the others, and of slightly smaller diameter at the shoulder. Their lever arm was also about one-half inch shorter than in the cases of the other two species.



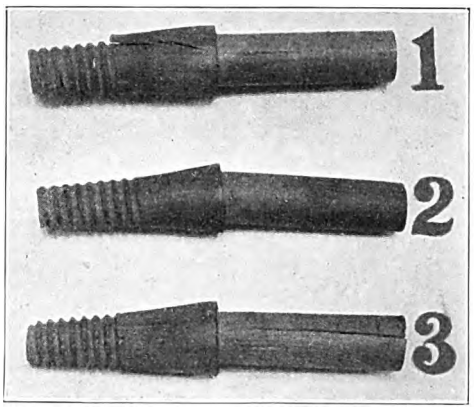
Testing Device for Insulator Pins.
1—Cast Iron Block; 2—Upper Fixed Head; 3—Pin Under Test; 4—Iron Insulator; 5—Heavy Wire; 6—Pulling Head.

In testing the pins an iron block was clamped to the fixed upper head of a small screw-testing machine. The pins were inserted to a tight fit in a hole in this iron block, and projected horizontally over the pulling head of the machine. The glass insulator was unable to bear the strain of the wire, so an iron model of the ordinary glass insulator was screwed on the pin and connected by means of a heavy wire to the pulling head of the machine. When a strain was put on this wire the pin acted as a beam fixed at one end and loaded at the other, which is practically the condition met with in practice. The breaking moment (maximum load times lever arm) is taken as a measure of the strength of the pins. The iron block mentioned was used in preference to a wooden cross-arm for supporting the pins for the reason that this iron block forced the pins to break under the test. Furthermore, it furnished uniform conditions for all pins. Thus, the results of the tests do not show the strength of a combination of pins and cross-arm, but they show the bending strength of the pin itself.

The following table gives the results of the tests:

Species	No. of Tests.		Weight of Pin in Grams.	Kings Per Radial Inch.	Breaking moment (Maximum Load Lever Arm)in Inch-pounds.
Black locust from Boston, Mass	23	Avg.	106.3	12	3 970
		Max.	119.3	25	5,380
		Min.	86.6	3	2.520
Black locust from Nashville, Tenn	7	Avg.	125.9	8	4 087
		Max.	147.1	11	4,980
		Min.	111.8	4	3,010
Rock elm from Nashville, Tenn	8	Avg.	93.8	42	2,512
		Max.	108.7	48	3,150
		Min.	77.5	33	1,450
Live oak from Houston, Texas	12	Avg.	127.1	Not distinguishable.	3.025
		Max.	141.0		4,590
		Min.	110.4		1.990

From the table it appears that the breaking strength of the two shipments of black-locust pins was practically the same, and may be taken as 4,000 pounds. Live-oak pins came next in order of strength, with a breaking moment of about 3,000 pounds. Rock-elm pins were the weakest, having a breaking strength of 2,500 pounds.



Failures of Insulator Pins.
1—Splitting from threads to shoulder; characteristic failure of locus and elm pins. 2—Tension at shoulder; characteristic failure of oa pins. 3—Shearing horizontally; an occasional failure within the block.

The oak pins were the heaviest, the locust next, and the elm the lightest.

The locust and elm pins failed mostly by splitting from the threads to the shoulder, or by tension at the shoulder. Occasionally the portion of the pin inserted in the block failed by shearing horizontally. The oak pins nearly all failed by tension at the shoulder.

A Blind Telephone Girl.

It is stated that Miss Susie Davis, a girl of 20, is the most accurate and rapid telephone operator in the Virginia City telephone exchange. She has been blind from infancy. When she first applied for the place she was told that it would be impossible for her to manage the switchboard without seeing it, as no other blind person had ever been employed in the telephone service. She persisted and finally got a trial. She learned every number on her board so well that in a recent competition in Virginia City to determine the most efficient operator, she beat all competitors. She is a graduate of the School for the Blind at Berkeley, Cal.

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Letters to the Editor

A Letter from Glass of Pekin.

EDITOR SOUND WAVES: I am always keen to take advantage of an invitation when I think it can result in mutual benefit. When SOUND WAVES asked for photographs in its May issue, I recalled one that is being forwarded to you. You will probably find it a little out of the ordinary as a picture, but it only reflects what successful telephone managers all over the United States must do to render satisfactory service to his telephone subscribers. By this I mean that he must surround himself with competent help, and the photograph I am sending you shows one manager, at least, almost wholly surrounded by his faithful employés.

It might be well for you to know that the Citizens' Telephone Company has only recently absorbed the Pekin Telephone Company. The present organization is capitalized at $200,000, and its officers are J. W. Barrett, president; John Fitzgerald, secretary; George H. Glass,

Manager and Operating Force of Citizens' Telephone Company.

general manager. The company enjoys a total of 3,200 subscribers and has 500 miles of toll lines. It has just completed a new toll line from East Peoria to Washington, thus giving Pekin connections with seven additional towns. At the time the Citizens' Telephone Company was originally organized there was no other Independent company operating in this section of the country. The exchange equipment is the Kellogg common battery type, with an original installation of 1,600 lines. The service has had such a demand that two additional positions have more recently been installed. There are 130 stockholders and seven directors, composed of the best business men in this city. In addition to this strong directorate, which includes the officers that have been named, the working force of the exchange includes E. M. Seibert, wife chief; Miss Leana Traud, chief operator; Miss Lottie Van Horn, bookkeeper; Mrs. W. Babcock, assistant bookkeeper; Miss Millie Nedderman, collector; Miss Clara Gebhardt and Miss Dean Meinen, toll board operators; and Misses Annie Tenner, Annie Schramm, May and Girdie Albee, Millie Johnson, Ida Schramm, Katie Johnson, Lizzie Tenner, and Annie Cassens, day operators; and Mrs. Tena Heft and Miss Dollie Hamilton, night operators. Outside construction is in charge of Mr. Albert Hudson, whose assistant is Mr. Franklin Hofliger. Mr. Roy Simms, assisted by Mr. C. M. Mathews, has full charge of the trouble department.

The careful reader may have observed the similarity in names among the young women employed by this company, which is explained by reason of sisters coming from four families. We believe in this respect that the Citizens' Company is able to present something unique.

It has been the thought of the management to follow the plan of railroads in maintaining the telephone system. Without appearing to be vainglorious, we believe that the Citizens' exchange and outside construction comes as near to perfection all the time as you would be able to find anywhere in the country.—GEORGE H. GLASS.

The "Independent" Sublicensee.

Editor SOUND WAVES: A little while ago a correspondent signing himself "Ozark," sent a communication which was printed in the *Western Telephone Journal*. The writer takes the liberty to quote from it in part as follows:

> I wish to tell about an individual who struck this section of southern Missouri not long since. The general manager of the Bell Company at St. Louis called on us by appointment and stated his case. The Bell was building, so he said, a long distance connection from Springfield to Thayer—130 miles—to close the gap between Kansas City and Memphis. To make this line profitable and also to give local companies along the route outside service, it was anxious to enter into a ten-years' contract with the locals. The stipulations of the contract, so far as the Texas County Telephone Company applied, were that we should receive its lines at our switchboard gratis; that we should rent of it at one dollar a year each not less than fifteen "long distance" transmitters and that we should retain ten per cent of the tolls originating at our central.
>
> We inquired why the company wished to connect with our central. Mr. Manager said "for mutual good." We told him any of the business men of the town would freely let him place a station in their stores and would gladly take care of it for an occasional toll free. He answered: "We want your assistance. We will get twice the tolls when connected with your three systems and toll lines." Then we asked if on a $2.50 toll to Chicago originating through our help, we would get twenty-five cents and the Bell would get $2.25. He said: "Not at all; you will get ten per cent up to ten cents and the rest must be accounted to us."

Our friend "Ozark" seems to lack gratitude for the kind and generous offer, for he closes his remarks with this:

> Create $2.50 for the Bell and get ten cents. Pay fifteen dollars for transmitters that are similar to and no better than those you have already paid for.
>
> The less the Independent companies have to do with such requirements the better it will be for them.

We want to rally to the defense of the downtrodden American Telephone & Telegraph Company. There are some things about the business of this concern which do not shed an attractive glow to all observers. It is barely possible that the Bell Long Distance Company does not emphasize all the beauties of the prospective sublicensee company. The stock offer of "the octopus" would seem to pay you well for time and terminal facilities, but it is well to beware. Experience has taught me that it takes more time to put through a single A. T. & T. call than is generally required to make forty local connections. If you don't believe this, you should ask a sublicensee victim. The time required on the part of your operator to make these unsatisfactory connections means money to you, and in considering the A. T. & T. proposition one is apt to overlook this element completely. I have known cases where the operator worked

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as long as two and one-half hours to establish an "in" connection for which you are allowed the princely sum of $000.

Ordinarily "the trust" is willing to use from 5 to 50 miles of your lines without insisting on paying you anything. You are usually required to keep a correct account of all "in" business, which pays you so liberally, and in addition you must guarantee the collection of all tolls, and so in reality you stand to lose only $2.40 on a $2.50 message! You should not forget the amount of money you are making all the time! You handle four long distance messages with a total toll charge of $6.50 and the octopus pays you the sum of 30 cents as your share of the business. Suppose there is an additional $6.50 of "in" business which would bring the total up to $13. Of course, some people regard 13 as an unlucky number, but nevertheless your percentage of the total business is something less than 3 per cent. But 37 cents will pay for the time of a lot of operators, and it will help defray expenses in the purchase of batteries. When you tie your system up with the Bell Company in your territory, the Bell receives at least 15 per cent of the line charge. You still get the 37 cents and the most courteous (?) treatment.

The sublicensees are not especially enthusiastic over A. T. & T. business after they have made the arrangement. I have a growing conviction that "Ozark" has the subject sized up pretty well for a man from Missouri. It is really astonishing, however, that we find this kick from a man who is paying $15 a year. We actually feel sorry for those misguided companies that are paying from $300 to $1,000 and more per annum. How foolish it is to complain on $15 a year when the Long Distance Bell business will return in real money at least $2. It begins to look like the 15 per cent, which does not exceed a 10 cent message, is a pretty good thing for the A. T. & T. Company. You must not forget that after the operator of a sublicensee exchange works by actual time two hours and fifteen minutes in establishing a connection, the calling party after his conversation may reverse the charges. This is only another trick in the "get-rich-quick" scheme which the sublicensee must realize to appreciate.

After several years of careful observation I am becoming convinced that the Bell Company is gradually losing prestige throughout the country. I have long been associated with the company, and there was a time when I believed this condition would never arrive. The company's salvation rests at present with its toll line service, but the Independents are gradually encroaching upon this feature of its business. When it can compete fully with the Bell in the matter of long distance service "the trust" will then have to "be good." SOUND WAVES has contributed very much in bringing about the present relations of the subscriber to the Bell and its methods, and for the sake of many men and women who have invested their savings in Independent enterprises, it is hoped you will never cease without giving ample warning.—M. J. C.

Southern Independents Prosper.

My past years of experience in the Independent field of telephony have been confined to southern Georgia and Alabama and Florida. During the past twelve months greater results have been obtained in this territory than in years heretofore. More interest in rural line construction is being manifested and the farmers are awakening more and more to the necessity of telephones. As a rule the rural lines are being built more thoroughly substantial.

C. C. Voile of Gainesville, Florida, has now about 525 miles of Independent toll line in his state connecting upper and lower Florida. Since the time when Mr. Voile began his toll lines the Bell Company has started the construction of a line from Jacksonville to Tampa, and it has encountered many obstacles. Several of the independent towns have refused to allow the Bell to enter and in other instances the company was compelled to go around the cities. There are in Florida today five Bell systems and fifty-two Independent systems, with probably five sub-licensees, including the Peninsular Telephone Company at Tampa and its tributary exchanges as one system.

The Independents have realized the economy in buying up-to-date apparatus and the time has come when only standard apparatus manufacturers have a chance. As a general rule the Independent owners and operators are very competent, which results in extremely good service. Incidentally, there are several manufacturing companies, which are reported to be owned and operated by Bell capital, that are being dropped by the Independents of the South.

I have been advocating an Independent telephone convention to be held at Tybe Island, Savannah, Georgia, this fall, and all readers of SOUND WAVES in Georgia, Florida, Alabama and South Carolina who are strictly Independent and who can and will attend the last week in September will please advise me at once, care of Marion Hotel, Atlanta, Georgia. I will then arrange a committee for accommodations.

This will be the first Independent convention for the South, and all Independents should manifest sufficient interest to attend. C. J. O'FARREL.

Progress in Omaha.

EDITOR SOUND WAVES: Substantial improvements are everywhere evident in this city. Large warehouses, business blocks, residences and churches are being erected. The street railway company is extending its lines, parks are being beautified, and railroads are increasing

Looking East on Farnam Street from Sixteenth Street.

track facilities; but among all other improvements it is clearly apparent that the work of the new Independent Telephone Company is receiving the most friendly comment.

For many years Omaha has been in the clutches of the Nebraska Telephone Company, and, as usual, the subscribers are obliged to take the kind of service that was meted out to them. The service has been poor and the prices have been high. The inhabitants of the Gate

City are, therefore, justifiably pleased, because hundreds of workmen are now tearing up the streets and alleys preparatory to laying the conduit. The activity is marked in all parts of the city. Red flags of warning flutter from piles of removed dirt by day and red lanterns mark the excavations at night. It will only be a matter of a short time until Omaha will have a modern telephone exchange, and the inhabitants of Iowa, Kansas, Missouri, Colorado, Wyoming, the Dakotas and all of Nebraska will be able to obtain connection with this metropolis. Bell bondage is shaken off. As usual with Independent progress, nothing but the best of material is being employed.

The Independent Telephone Company has purchased the site for its new exchange building, and work will be

Manholes and Junctions at Fourteenth and Farnam Streets.

commenced at once. It will not be necessary to recall the bitter contest that was waged by the Independent company. In regard to this enterprise it will be remembered that it required an electoral expression of the people, who demanded competitive service. The city is fortunate and its citizens are to be congratulated in having behind the company now building men of ability who will see to it that Omaha subscribers have nothing but first-class service.

The accompanying snapshots are sent along with the hope that they may be worthy of reproduction.—H. C. M.

The Telephone in England.

John Ardron, assistant scretary of the British postoffice, in charge of telephones, foreign telegraphs and wireless telegraphs, in a recent interview gave some interesting information regarding the telephone development of London and Great Britain.

Briefly, the history of telephony in Great Britain is as follows: In 1880, by decision of the courts, the telephone was considered a telegraph and therefore came within the telegraph monopoly of the British postoffice. At first operating licenses were granted to thirteen private companies, but one of these companies, the National Telephone Company soon absorbed the others.

Under its license, which expires January 1, 1912, the National Telephone Company has been obliged to pay the postoffice a royalty of ten per cent of the gross revenue from exchange business and the postmaster general has reserved the right to purchase the telephone business by giving six months' notice at certain periods in the life of the license, the price to be determined by arbitration. In 1892, as toll and long distance business was cutting into the telegraph revenue, the government took over from the National Telephone Company the interurban lines. In 1900 the British postoffice instituted a telephone service of its own in London to compete with that of the National Telephone Company. Two years later, in 1902, the obvious disadvantages of competition were seen, and an intercommunication agreement was made, whereby the two systems would interchange telephone service.

Coincident with the establishment of the London postoffice service, the government encouraged the municipalities to install municipal telephone systems, and competing systems were installed at Glasgow, Portsmouth, Swansea, Brighton and Hull. These experiments were failures, and the systems have been taken over by the postoffice, which has also arranged to purchase the business of the National Telephone Company, when its license expires January 6, 1912. Although the government has at all times controlled the telephone industry, after 1911 it will own and operate the entire telephone service of Great Britain. Mr. Ardron said that in London, with an area of 640 square miles, at the present time there are 130,000 telephones, with a constant addition of new subscribers at the rate of about 10,000 a year. Ninety thousand of the whole number of London telephones belong to the National Telephone Company, and 40,000 to the London postoffice. In Great Britain, outside of London, there are 260,000 telephones, 230,000 belonging to the National Telephone Company and 30,000 to the postoffice.

A Shanghai Telephone Directory.

Thomas J. Keech, district manager of the Michigan State Telephone Company, has received a telephone directory from Shanghai, China, which is of special interest to telephone people and of considerable interest to the public in general.

The book is artistically gotten up, having a semi-stiff cover and glazed paper. The directory covers but a little more than half of the page, the broad margin evidently being intended for notes or references. On the flyleaf is the name, "The Shanghai Mutual Telephone Compapny, Limited. Gustaf F. Oberg, secretary and general manager."

The directions for using are given as follows:

"To call up—

"Turn the handle of your instrument once round.

"Take the receiver off its hook or crutch and place it to your ear and wait operator's reply 'Central Office'," etc.

"Directions when called—

"Take your receiver off and place to your ear and give your number.

"If your telephone rings and you find no one there put it back and take no further notice," etc.

"Note—Speak low and slowly and you will avoid misunderstanding."

According to the directory the company has approximately 3,000 subscribers comprising an interesting list: Che Shun, 10 Foochow Road; Chang Sing Chee, Shans Road; Chang Su Ho, Bubbling Well Road; Chung Yue Chang, Nanking Road; Chow Wau Pang, Myburgh Road; and in the midst of these is No. 236, Golf Club, and 1500, John Goodnow, former American consul to China.

The directory has a numerical index with the direction to "Look to the first column for the number you wish to identify; in the second column will be found the number of the page on which it appears."

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A Study of Telephone Generators

Showing a Comparison Between Electrometer Methods and the Use of the Oscillograph in Determining the Voltage, Current and Wave Forms of Various Machines

By G. W. Wilder

WHEN a conductor moves with constant speed in a uniform field, the pressure generated will depend upon the rate at which the magnetic lines of force are cut by the conductor. If the rate is uniform, then a constant electromotive force will be the result. In the ordinary form of generator the conductor consists of several turns of wire wound around the core of the armature, while the field is due to permanent horseshoe magnets. The conductor revolves around with the armature at constant speed, cutting the lines of force at a rate which depends upon the position of the conductor at any instant.

In Figure 3 an ideal case is shown, which represents a conductor revolving in a uniform field, the latter being due to two pole pieces marked *N* and *S*. In this instance the field between the ends of the poles is assumed to be perfectly uniform; that is, there are an equal number of lines of force per square inch throughout the intervening space. A conductor placed in this field and revolved in the direction indicated by the arrow will cut the lines at a rate which varies from zero to a maximum and back to zero again. At the edges of the field where the arrows are placed the conductor moves parallel to the lines for a short distance. As it moves toward the central portions of the field, however, its motion becomes more nearly at right angles to the direction of the lines and consequently the rate of cutting becomes greater and the corresponding pressure generated also increases. At the central portions of the field this rate is a maximum; from this point on the rate

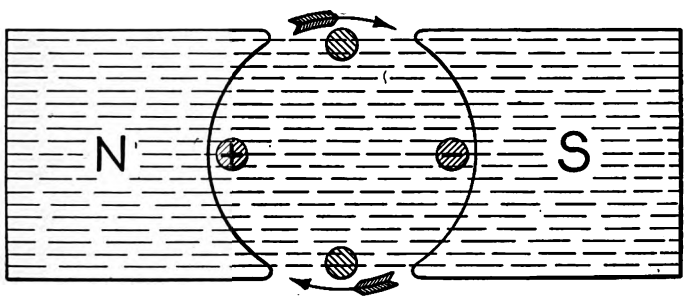

Figure 3.

increases to zero at a point on the opposite side of the field marked by the second arrow. The second half of the revolution produces a like change in the rate of cutting and consequently a similar varying pressure. It will be noticed, however, that the lines are cut in this instance in the opposite direction to that in the first half of the revolution, the result being that the electromotive force is now in the reverse direction. This means that during one-half of the revolution a current will be produced that will flow through the circuit closed by the armature wire such that it will rise from zero to a maximum and then decrease to zero again; during the remainder of the revolution the current will reverse its direction and increase a second time to a maximum and then decrease to zero.

The form of such a current and the pressure producing it is shown in Figure 4, and is known as the sine curve; it is the ideal form of an alternating current and has many interesting properties. As will be seen, the value of the current or its pressure at any instant is different from that at any other instant. Always changing, it never has a constant value. What, then, will be

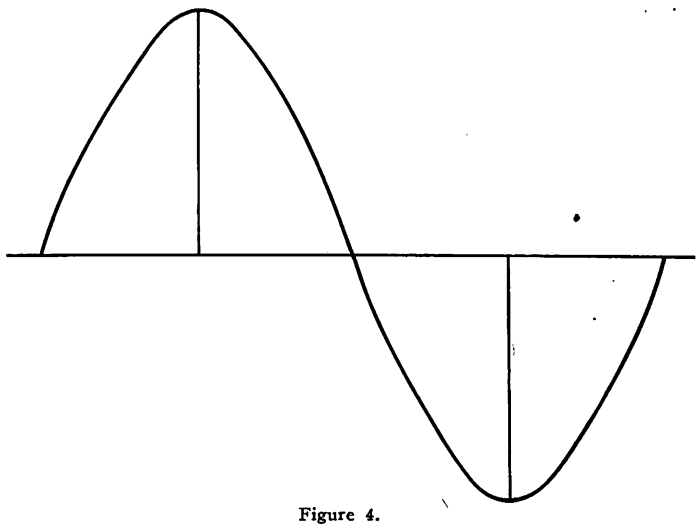

Figure 4.

taken as its effective value? One could agree to take the average value of the vertical values as representing the effective pressure, and this would probably have been done were it easy to make an instrument which would readily indicate such values. Unforunately, however, our measuring instruments, as a rule, depend upon the electrodynamic action of two currents upon each other, or upon some heating effect, and in either case the indicated results are proportional to the square of the current. This means that such instruments do not measure the real average of a current, but measure what is called the square root of the mean square. The average value is found to be 0.6369 of the maximum value, while the square root of the mean square, or the real effective value, is found to be slightly larger, it being 0.707 times the maximum value.

Since in an actual generator we have considerable iron in the armature, the field between the pole pieces is not necessarily uniform. Any deviation from a perfectly uniform field will cause the rate of cutting the lines to vary from the way just pointed out, and as a consequence we get an electromotive force which will be represented by the curve drawn in the above case. For this reason the curves of different machines differ widely in practice, especially among those machines that are designed for power or lighting purposes. Telephone generators, as a rule, give a much more pointed curve, owing to the fact that the iron of the armature is rather peculiarly distributed.

A curve showing either the current or the electromotive force may be obtained in several ways, one of the simplest being to measure the actual voltage, or current, as the case may be, at several positions, as a conductor is moved through the field. An ordinary telephone generator may easily be tested, since there is only one conductor and this is wound several times around the core of the armature. A machine having several conductors, such as are found on a direct current

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dynamo, may be a little more difficult to measure, as in such a case it is necessary to take one of the coils or to make use of an extra coil known as a test coil. The general method is to arrange a wheel called a contact maker, provided with two brushes, so that one of the brushes makes continual contact with one end of the armature winding while the other makes a contact only for an instant during each revolution. The point of contact may be placed at any desired point of the revolution by moving the brush around the periphy of the instrument upon which the degrees are marked. A circuit between the two brushes is made by leading a wire through a voltmeter. Once during every revolution the contact brush makes a complete circuit through the armature winding and the voltmeter; the corresponding voltage may then be read off from the latter instrument. The contact maker is then moved around to a new point on the dial and another reading is obtained. In this way readings may be obtained for as many points as desired, for a complete revolution of the armature and the values resulting may then be plotted on the vertical lines of a cross-section paper, the values

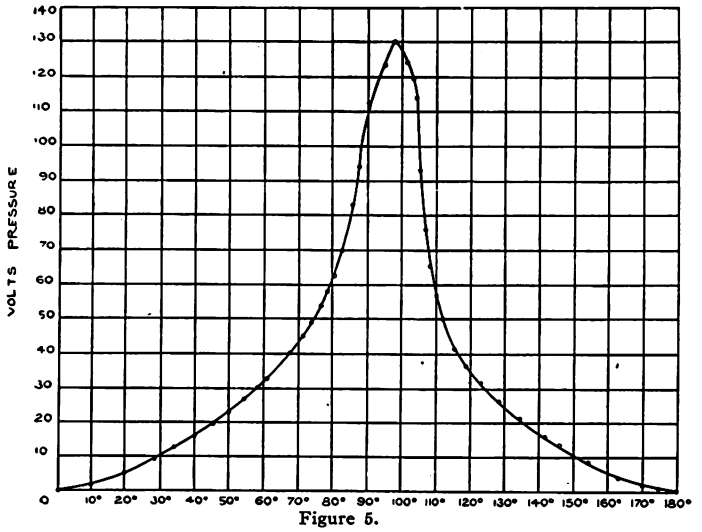

Figure 5.

of the corresponding angles of contacts being laid off on the horizontal lines.

The pressure curve of the above described generator was found in this way and the results plotted in the curve shown in Figure 5. An electrostatic voltmeter was used so as to obtain the true values, as otherwise the current necessary to actuate an instrument whose action depended upon the electrodynamic action of two currents would be equivalent to a load upon the machine. The origin of this curve is taken for a position of the armature which is shown in Figure 6. This is the normal position of any generator of the telephone type, and in this position all of the lines of force thread through the windings of the coil as indicated in the figure. Since iron offers a better path for the flow of these lines, they seem to bend around in order to pass through the iron. They do not take the shortest path from pole to pole, but concentrate themselves in the iron, thus following the peculiar curves as shown.

In this position of the armature the windings do not immediately cut the lines when revolving, owing to the fact that they are at this instant moving parallel to them, so the resulting electromotive force is zero. Now, as the armature moves into the position shown in Figure 7, it will be seen that the windings are cutting the lines at a rate which increased from zero to the certain amount depending upon the distribution of the field at that point. Represented upon the curve in Figure 5, an increase in the voltage is shown which is not unlike that shown in the ideal curve in Figure 4, although the rise is not so rapid. Figure 8 shows the position after the armature has made a quarter of a turn. Here the lines are threading through both sides of the armature and are about to be reversed in direction as the armature turns a little farther on, as shown in Figure 9.

Ordinarily one would expect that the maximum rate of cutting would occur at this point, and in an ideal machine it does. A little thought, however, will show that this is not the case, for some of the lines are still threading through the sides of the iron core and remain to be cut at a later instant when the armature has passed toward an advanced position. This point is about ten

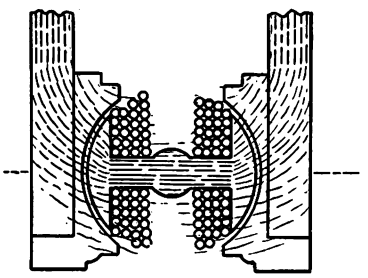
Figure 6.

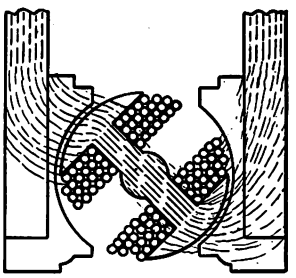
Figure 7.

degrees farther along, as will be seen by examining the curve. From this point on the rate of cutting becomes more rapid and the curve descends more rapidly than it ascends, because a great shifting of the lines takes place during a short interval in the rotation of the armature. From the third position the pressure decreases more slowly and finally reaches a zero value at a point when the armature has turned through one-half a revolution. The remainder of the cycle is an exact duplicate, excepting, of course, that the curve would be plotted below the axis since the pressure in this case is in the opposite direction.

Another way of reasoning on this problem is to think of the lines of force as having a lateral repulsion for each other and also exerting a tension along their lengths. In the normal position of the armature the lines thread across from pole to pole, through the iron, in the shortest possible direction. As the armature turns the lines must be stretched in order to retain their new positions, and consequently it requires some force to overcome their tendency to resist the stretching. At a point a little beyond the quarter turn the lines suddenly

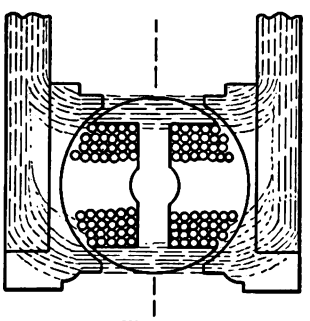
Figure 8.

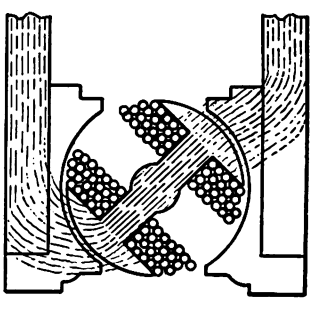
Figure 9.

change their directions and assist the motion of rotation.

From the data the maximum pressure is found to be 130 volts, while the average voltage is 32 volts. The effective pressure is 35.2 volts. This shows that the maximum pressure is very much larger than that indicated on an ordinary measuring instrument, and sometimes this is great enough to do considerable damage to insulation

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and condensers, although instruments would indicate that the voltage was very low indeed.

The generator was next attached to a motor whose speed was constant, and measurements were taken of current and pressure at different loads. Starting with an open circuit the machine gave its maximum pressure with no current. A resistance of ten thousand ohms was then added to the circuit and the corresponding current and pressure noted. The resistance was then decreased by steps and sets of readings obtained until the machine was short circuited and a maximum current obtained. The current was measured with a milliampere electro dynamometer of very low resistance.

Figure 10 shows the results of these readings, volts being plotted on the vertical axis at the left and current in milliamperes on the horizontal scale at the bottom. It will be seen that the curve descends gradually toward the right in almost a straight line. This shows that the pressure and the current are nearly directly proportional to each other—a thing which is true when there is no inductive effect due to the armature, providing, of course,

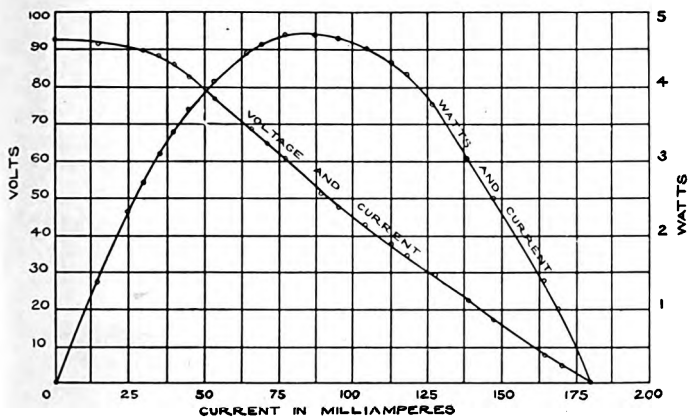

Figure 10.

that the external resistance is non-inductive. That the inductance of the armature is small agrees well with the conclusions drawn in the previous experiments.

From the observations of current and pressure, a curve showing the relation between the current and the output of the machine may be plotted since the output in watts is equal to the product of the volts times the amperes. Such a curve is also shown in Figure 10, in which the watts are plotted on the vertical scale at the right of the figure and the current is plotted on the horizontal axis as before. This curve rises from zero again at the point of maximum current. The general form of this curve indicates that the maximum output is reached for a value of current equal to one-half of the maximum furnished when the machine is on short circuit. It will also be noticed that the maximum output is not really confined to a single point, but is distributed over a considerable range, which is a very desirable feature in a telephone machine, considering that most five-bar generators are required to operate on loads that may vary from a small amount to a large one. The smallest load for such a generator consists of one bridging ringer of about 1,600 ohms resistance, while the largest seldom exceeds thirty such ringers placed in parallel with each other, making a total resistance of one-thirtieth of the resistance of one alone, or about 53 ohms. The values of current and voltage for these values are 65 amperes and 4.4 watts and 168 amperes and 1.2 watts, respectively.

(*To be continued.*)

International Independent Telephone Association.

The new fiscal year of the association opens with bright prospects. Never in the history of the movement have the various interests of the Independent telephone industry worked together so harmoniously as at present. The operators, investors, manufacturers, supply men and publishers are determined to stand as a unit for all time to come, dominated by the idea that what is good for one is good for all.

In view of this happy state of affairs the new administration enters upon the performance of the trust committed to its care by the unanimous vote of the association with enthusiasm and a determination to boost the telephone business, and with the conviction that the coming year will be not only one of wonderful physical development, but also one of unprecedented ethical progress.

The Independent Spirit.—In various sections of the country the Independent operators have rejected, with commendable unanimity, traffic overtures made by the opposition. The Independent spirit has dominated everywhere the action of individuals and state associations, and not one break in the ranks has been reported from the Atlantic to the Pacific since the International convention in Chicago. It will be the aim of the new officers to still further develop this feeling of unity, which, coupled with a demand for telephone service supplied in a popular way, has made the Independent telephone industry one of the greatest industrial factors in the United States and Canada and has given the people of these countries a telephone service which, in efficiency and economy, is without an equal in the world.

New Executive Committee.—Your president has, after mature deliberation, and with the approval of the advisory board, appointed the following executive committee: W. B. Woodbury, Detroit, Mich.; O. C. Snider, Kansas City, Mo.; J. B. Hoge, Cleveland, Ohio; G. N. Bandy, Des Moines, Iowa; A. C. Lindemuth, Richmond, Ind.; W. E. Doolittle, Lafayette, Ind.

None of these gentlemen needs an introduction to members of the association. All are known throughout the length and breadth of the land as men who have given much of their time and talents to the cause in various lines, and your president congratulates himself and the association upon having secured their cooperation and assistance in disposing of such problems as may arise from time to time. Chicago being easily accessible to all from their respective places of residence, should insure good attendance at committee meetings.

Removal of Headquarters.—It has been decided to remove the headquarters of the association from Cleveland, Ohio, to Chicago, Ill., the latter city being located more centrally and also more easily reached from every section of the country. The fiscal and industrial importance of the Independent telephone business rendered it advisable to locate the executive offices either in New York or Chicago, and the final choice fell on the latter city on account of the fact that it is, at present, the center of Indepnedent development. However, the headquarters will remain at Cleveland until arrangements have been completed for transferring same to Chicago, due anouncement of which will be made.

Mr. Charles West, secretary elect, will not take active charge, but Mr. J. A. Harney, the assistant secretary, will perform the duties of secretary for the secretary.

More Publicity.—While no definite plans have been made for the year's work, it can be stated, nevertheless, that particular attention will be paid to spreading the

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gospel of Independent telephony and boosting the telephone business generally by means of newspaper and magazine publicity. The importance of our business is not yet understood by the American public, who must be educated to realize the extent of the industry. Very few understand the magnitude of the investment required, the service it renders to the people and the legitimate profit it pays investors. Money invested in publicity will benefit every Independent operator by creating a demand for his securities and his service. While the association's publicity service will be national in character, yet attenton will be paid to sectional needs, wherever necessary.

Reading Notices.—Under the management of the publicity department, suitable write-up on almost any subject pertaining to Independent telephony will be furnished free of charge to members for reproduction locally. Write the secretary for the information wanted. Generally the matter furnished will be so prepared that local papers will gladly publish same as news items.

Boost the Telephone Business.—Let everybody talk up the good points of the telephone business.

Monthly Financial Statement.—Commencing with Bulletin No. 2, a monthly financial statement will be published, showing the fixed charges, state of treasury, assessments, receipts, and disbursements of the association.

Managers.—Look for the shield stamp on all telephones and switchboards purchased. It is an assurance that the manufacturer is contributing to the support of the association.

Association to Incorporate.—The association will be incorporated at an early date by the advisory board, with a nominal capital, and the articles of association will provide that it shall not be run for profit.

Supply Department to Be Discontinued.—The association has decided to discontinue the supply department as soon as the stock of "shield" supplies, now on hand, can be closed out. This stock consists of colonial lanterns, standard toll signs, large and small transparencies, inside celluloid toll signs, cardboard toll signs for construction work, gold plated emblems, celluloid buttons, and "shield" electrotypes for one and two color printing. Customers who have dealt with the association in the past know that the goods handled by it have always been of the best quality, unsurpassed in design and lasting properties. The discontinuance of the supply department offers them an opportunity of procuring "shield" advertising essentials at reduced prices. Managers who have hitherto failed to give "shield" advertising a trial can now participate, at a minimum cost, in the advantage of this mode of pushing and individualizing their business. The association has never aimed to make money out of its "shield" supplies. It has bought goods in large quantities and sold them at a very slight advance to the Independent operators. In order to close out the department without unreasonable delay, it has been decided to dispose of the stock on hand, which is fresh, clean and first class throughout, at a substantial discount from previous prices—in other words, at figures much less than the individual buyer could obtain otherwise. As this is an opportunity that will not be open very long, managers and individuals are advised to act at once. No new goods will be purchased by the association and orders will be filled in the order of their receipt. From the latter rule there will be no deviation. Price list and further particulars about discounts may be obtained upon application to the general office at Cleveland, Ohio.

Map Work Held in Abeyance.—The may department has been discontinued for the time being. This branch of the association's work has accomplished the purpose for which it was created, but has been left in such shape that it can be revived at a moment's notice, should occasion require.

Chronicle Discontinued.—The publication of the *Chronicle* has been discontinued. Settlement for unexpired subscriptions and paid in advance advertisements will be made in due time.

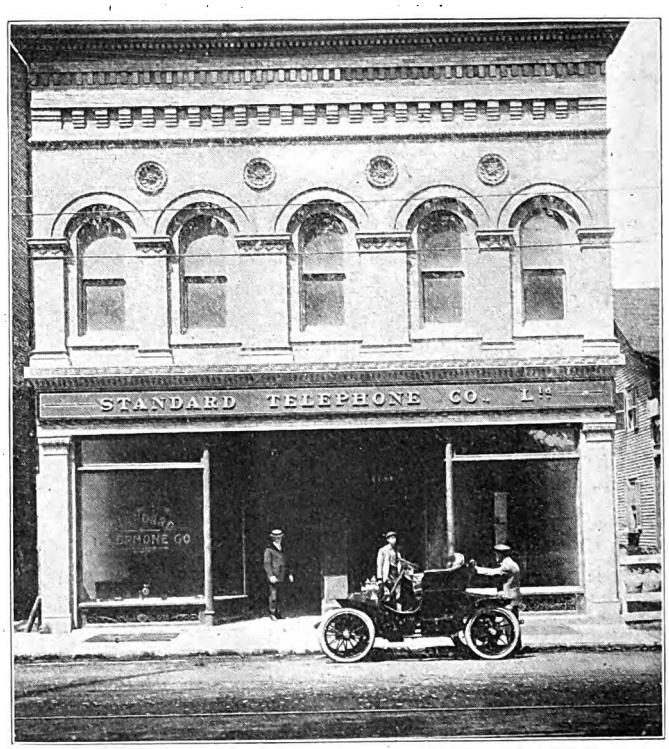
1907 Convention Proceedings.—All desiring copies of the last annual convention proceedings will please write the assistant secretary at once, stating number wanted. This information is necessary in order to provide a sufficient number of copies for distribution. We have some of the 1906 reports nicely bound, which will be mailed free on application as long as the supply lasts, on receipt of 7 cents in stamps for postage.

Honorary Members.—Since the last report has been issued to the press, Mr. D. A. Walker, Columbus, Ohio, ad Mr. E. L. Swaine, Los Angeles, Cal., have qualified as honorary members of the association.

Bulletin No. 1, 1907. THEODORE GARY, *President.*

Island Home of Automatic.

In the April issue of SOUND WAVES we devoted considerable space to the story of the Standard Telephone Company, Limited, an Independent operating company with a franchise for the Island of Oahu, Hawaiian group. We are presenting herewith a picture of the new home of the Standard Telephone Company, which has adopted the Strowger system. The building is located at 69-71 Beretania avenue, Honolulu, having a frontage of 35



Home of the Standard Telephone Company.

feet and a depth of 104 feet. It is well adapted for the automatic system. It will be the plan of the company to occupy the ground floor with its business office, drafting and construction departments, reserving the upper floor for the switchboard apparatus.

As we have already stated, the franchise requires underground wires for the business section of Honolulu. Outside of the business district all cable will be adopted.

Recent Telephone Patents

By David S. Hulfish

852,523. Automatic System. J. G. Roberts, assignor to Western Electric Co. Filed February, 1906. A central office line relay has the equivalent of a fast armature and a slow armature, and an automatic selector and connector are thus controlled over the metalic circuit of the line. A common battery system.

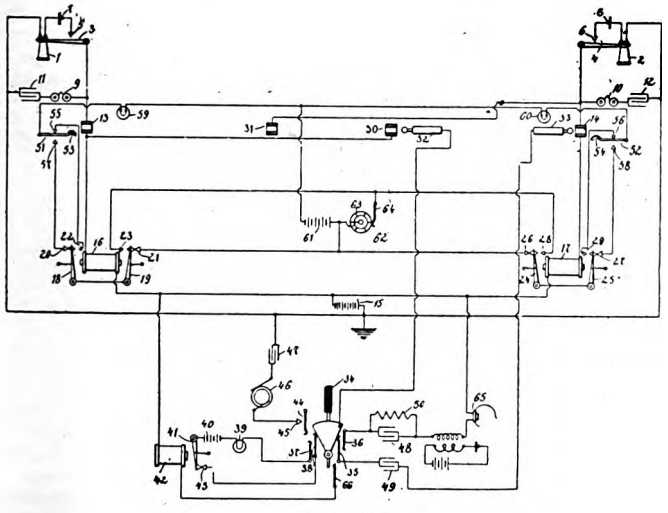
852,575 Selective System. Nils E. Norstrom, Chicago, Ill. Filed Oct., 1901. A lockout step-by-step party-line selecting system.

852,675. Selective System. Nils E. Norstrom, Chicago, Ill. Filed April, 1901. A party-line selecting system. A feature is the use of a line conductor looped in and cut at each station.

852,743 and 852,744. Register. David F. Stakes, assignor to Keystone Tel. Co., Philadelphia, Penna. Filed June, 1905. A device for transmitting electrically to central the full dial reading of a subscriber's meter. The device sends in first the telephone number and then the dial reading of the meter.

852,806. Attachment. F. S. K. Smith and D. C. Reinohl, Washington, D. C. Filed Sept., 1906. A padlock device for locking down the hook lever of a desk stand.

853,002. Telephone System. Edward J. Burke, Brooklyn, N. Y. Filed Oct., 1905. A one-wire-multiple and one-way-cord common battery switchboard system. (See cut.)



853,002

853,118. Attachment. Harry E. Richey, Perrysville, Penna. Filed Jan., 1907. A receiver holder for desk stands.

853,186. Receiver Shell. Wm. J. Murdock, Boston, Mass. Filed May, 1902. A cast composition shell reinforced by tough fiber.

853,286. Trunk. H. G. Webster, assignor to Kellogg S. & S. Co. Filed Aug., 1902. A trunk for Kellogg common battery multiple switchboards.

853,287. Signal System. H. G. Webster, assignor to Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y. Filed Sept., 1903. A system for common battery switchboard, using a bridged impedance per line and a bridged relay per cord.

853,291. Telephone System. Garrison Babcock, assignor to Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y. Filed July, 1903. A party line on which any party may call central or may call another party on the same line without calling central.

853,292. Relay. J. A. Birsfield, assignor to Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y. Filed March, 1905. A relay of the return-pole-piece class.

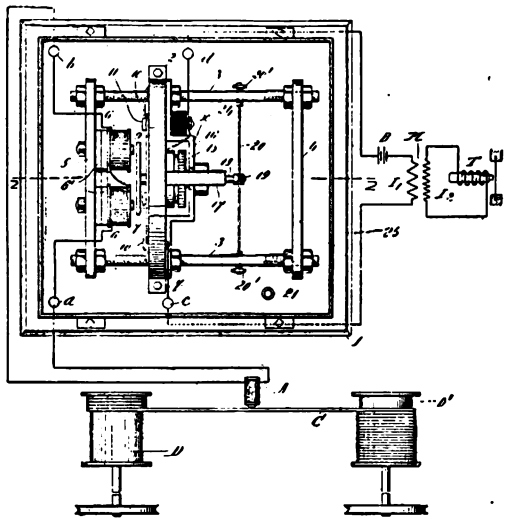
853,304. Ringing System. Arthur R. Kahl, assignor to Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y. Filed Jan., 1906. An automatic ringing circuit for common battery switchboards. The line is rung until the party answers and the ringing thereafter is automatically discontinued.

853,305. Relay. Wm. Kaisling, assignor to Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y. Filed Nov., 1903. A polarized relay having a braking device for the armature.

853,337. Transmitter Case. J. A. Birsfield, assignor to Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y. Filed Feb., 1905. A pressed metal transmitter case.

853,370. Springjack. F. R. McBerty et al., assignors to Western Electric Co. Filed Dec., 1904. A specific arrangement of springs in a strip of springjacks.

853,373. Register. Arthur R. Pollock, Piqua, Ohio. Filed Aug., 1906. A device for recording the peg count of an operator and for recording the operator's drag on calls.



854,120

853,389. Drop. Klas Weman, Buffalo, N. Y. Filed Dec., 1905. A ringdown drop responsive to direct currents only.

853,578. Receiver. A. F. H. Davis, assignor to National Telegraphone Co., Rochester, N. Y. Filed Nov., 1905. A receiver utilizing a non-magnetic diaphragm.

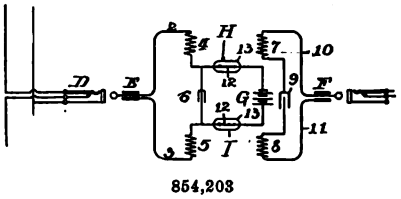
853,672. Attachment. W. A. Beavan, Philadelphia, Pa. Filed Dec., 1906. A receiver holder designed for attachment under the head of the transmitter bolt.

853,682. Trunk. W. W. Dean, assignor to Kellog S. & S. Co. Filed June, 1902. A trunk circuit for Kellogg common battery multiple switchboards.

853,818. Automatic Telephone System. Friedrich Merk, Berlin, Germany. Filed Jan., 1907. A new system of arranging Strowger switches to reduce the number of switches required. (See illustrated article "Design in Automatic Exchanges," in this issue.)

853,855. Desk Telephone. A. K. Andriano, assignor to Direct-Line General Telephone Co., San Francisco, Cal. Filed July, 1905. A desk outfit for automatic intercommunicating system.

854,025. Transmitter. Ralph C. Browne, Salem, Mass. Filed April, 1906. The transmitter contains a granular carbon cell in which the current is passed through the cell in a path parallel to the diaphragm instead of normal to it as is usual.



854,203

854,120. Repeater. John S. Stone, Cambridge, Mass. Filed May, 1906. A mechanical telephone repeating device,

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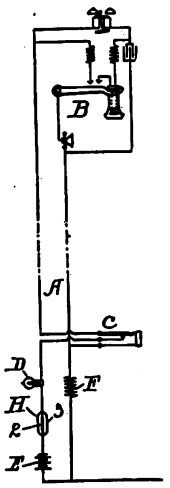
comprising a pair of receiver coils and a granular carbon transmitter button. (See cut.)

854,164. Automatic Switch. Paul Hildebrand, Munich, Germany. Filed Aug., 1905. An automatic switch and system for small automatic exchanges.

854,203. Cord Circuit. Claude D. Enochs, assignor to Vote-Berger Co., La Crosse, Wis. Filed April, 1905. A "ballast" cord pair for giving substantially equal currents to all lines regardless of the length of line. (See cut.)

854,204. Line Circuit. Claude D. Enochs, assignor to Vote-Berger Co., La Crosse, Wis. Filed April, 1905. A "ballast" line lamp circuit. No line relay is used, a "ballast"



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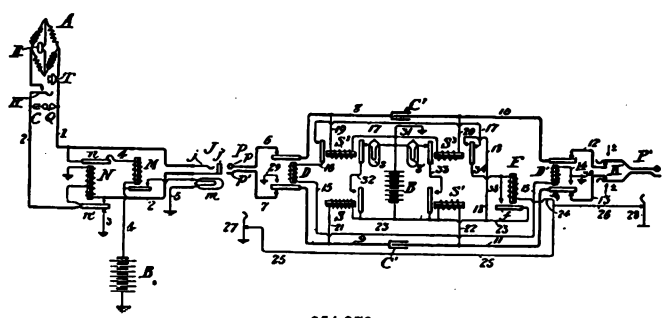
being included in series with the lamp whereby the lamp receives substantially the same current regardless of the length of line. (See cut.)

854,272. Heat Coil. Frank B. Cook, Chicago, Ill. Filed Nov., 1903. A heat coil, and auxiliary means for restoring an operated heat coil to its previous condition before the coil has cooled, thereby making it ready for resetting.

854,279. Telephone System. W. W. Dean, assignor to Dean Electric Co., Elyria, Ohio. Filed May, 1905. common battery multiple switchboard cord pair circuit. When the subscribers of a connection hang up their telephones the



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busy test is taken from their lines immediately, and the lines are available for further calls, though the previous connection may not have been taken down by the operator.

854,337. Trunk. W. W. Dean, assignor to Kellogg S. & S. Co. Filed June, 1901. A trunk for Kellogg common battery multiple switchboards.

854,439. Microtelephone. Alfred Stromberg, assignor to Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y. Filed Nov., 1903. The receiver is pivoted on the handle and has a switch corresponding to the telephone hook switch which is operated when the receiver is swung on its pivot.

854,472. Attachment. Josiah W. Dolson, New York, N. Y. Filed July, 1906. A frame for holding a web of fabric over a transmitter mouthpiece.

854,543. Party-line System. Guy E. Terhune, Wm. M. Eidson and Wm. B. Huston, Willow Hill, Ill. Filed Nov., 1905. A step-by-step party-line system.

854,552. Switch. James S. Alsobrook, Wood Station, Ga. Filed June, 1906. A switch in a party-line subscriber's telephone which enables him to ring on the line in either direction by cutting off the line in the other direction.

854,780. Ringer and Drop. Henry Tideman, Menominee, Mich. Filed Jan., 1905. A ringer with drop shutter for farm switchboards. The tapper has wedge teeth to assist the drop in falling.

854,830. Register. Ray H. Manson, assignor to Dean Electric Co., Elyria, Ohio. Filed Oct., 1906. A subscriber's meter with audible signal to indicate to the operator that a call has been registered.

854,971. Attachment. Edward B. Thomas, Columbus Ohio. Filed June, 1906. A card case for card directory arranged to mount on a transmitter.

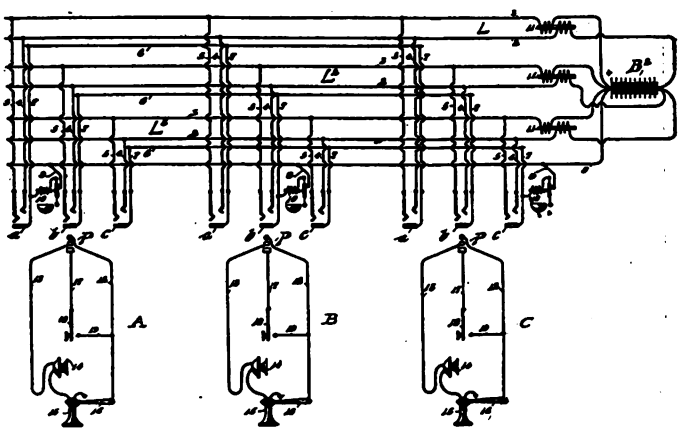
855,117. Test Set. James M. Miller and Clinton J. Murray, Newtown Square, Pa. Filed June, 1906. A specific arrangement of transmitter, receiver, switch, ringer and generator in a lineman's test set.

855,168. Ringing Key. O. F. Forsberg et al., assignors to Western Electric Co. Filed October, 1902. A key for ringing "code signals" on party lines.

855,208. Insulator. Herbert Sinclair, Trenton, N. J. Filed Feb., 1907. Outer and inner knobs are held by one screw and hold the wire between them, without tie wire.

855,391. Switchboard. John M. Dosbaugh, Cedar Vale, Kans. Filed Aug., 1905. The novelty lies in mechanical devices displacing answering plugs and jacks for the switchboard operator. Disconnection is effected automatically.

855,394 and 855,395. Transmitter. Oscar F. Falk, assignor to Am. Tel. & Tel. Co. Filed July, 1905. A granular



No. 843,329.

carbon transmitter for microtelephones, having its carbon button mounted within the case at an acute angle to the plane of the diaphragm.

855,458. Transmitter. Newman H. Holland, Chicago, Ill. Filed July, 1906. The novelty lies in the manner of holding the carbon granules.

855,545. Telephone System. Harry G. Webster, Chicago, Ill. Filed Dec., 1904. A common battery multiple switchboard circuit, using three-wire multiple and two-way cords.

855,546. Telephone System. Harry G. Webster, Chicago, Ill. Filed Dec., 1904. A common battery relay multiple switchboard circuit using two-wire multiple and two-way cords.

855,911. Receiver. Kelley M. Turner, assignor to General Acoustic Co., New York, N. Y. Filed Feb., 1907. The receiver coil is divided and a rotary switch enables the telephone user to send the speech currents through all or only a part of the receiver coil, at will.

856,146. Lockout System. Ruben C. M. Hastings and Thurston Matheny, Athens, Ohio. Filed May, 1906. A device for party lines. Any station may selectively ring any other station, and either of the two stations in conversation then may lock all others off of the line. Selective ringing is step-by-step, and is accomplished by locking all bell tappers except at the station desired to be rung.

856,161. Attachment. Samuel A. Kitchener, Los Angeles, Cal. Filed Jan., 1907. A card directory for mounting upon a transmitter.

Any patent mentioned herein may be purchased from the Commissioner of Patents, Washington, D. C., for five cents in coin. Postage stamps not accepted.

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Current Convention Papers*

INDEPENDENT TELEPHONE SECURITIES AS AN INVESTMENT.

ANY enterprise launched under unbroken bright skies may reach a point where it becomes inviting to investors, but until it has successfully withstood the test of adverse conditions, usually sure to come, its enduring ability to pay dividends and keep its principal unimpaired is a matter of conjecture.

Any industry handicapped in all directions at the start and subject to unscrupulous competition and which, notwithstanding, carries its business to a successful issue and a growth beyond expectations, has earned the right to invite capital. This being true, the investigating investor must view with favor those securities issued by carefully conducted Independent telephone companies.

Passing through years of constant warfare directed against them by one of the former great monopolies—the American Telephone & Telegraph Company (Bell)—a competitor who had at its command unlimited capital, a press bureau, trained legal and electrical talent, etc., while the Independents had no experience, no long distance service, exceedingly limited manufacturing facilities, with capital suspicious, threatened and actual lawsuits, the Independents have met every condition and emphatically have won the long-fought battle. Today they are equipped with the best electrical appliance, both in the manufacturing and operating branches, enjoy a large and rapidly increasing long distance service, all legal battles are decided in their favor, the investor's confidence is gained and competition has largely ceased to be a disturbing factor.

W. L. Moellering.

Almost without exception, wherever both companies occupy the same field, the Independents outstrip the old monopoly. In character of service they excel in a marked degree, in growth they surpass tenfold, and financially they are able to pay dividends, meet obligations and create a safe surplus. Has it ever occurred to you what the record will be in ten years from now under the changed conditions? Has the investor compared the present market value of Independent securities, their rise during the recent years, with the present market quotations of the Bell or its subsidiary companies' stock as compared to past years? It is eloquent of the situation.

Is it not true that the best criterion of the value of a security is in the regard in which it is held among its home people who are in a position to best know its strength or weakness, and is it not a fact that home people are the largest and most constant buyers of Independent telephone stocks and bonds, in many instances absorbing the full issue?

Witness Toledo, Ohio; Fort Wayne, Los Angeles, Kansas City, St. Louis, South Bend, Grand Rapids, Louisville, Cleveland, Columbus, Muncie, and hundreds of the larger cities in all sections of the country where home capital takes either all or the larger part of securities.

If you happen to live in a community where capital is timid, try a tabulated statement showing in detail your earnings, expenses, growth, with all future possibilities, select a number of the larger telephone companies who have operated a number of years and give their experience, their rise in stock values, and let your statement contain a list of other home industries in comparison. You will be surprised how many good industries in your midst fail to show as good results as you do.

The regular dividend distribution ranging from 3 per cent to 10 per cent now being paid by most Independent companies, and the creating of a surplus fund after having made proper deductions for depreciations, has made the investor take notice, and former prejudice fostered by the opposition has given way to impartial investigation with most encouraging results.

It must be patent to every observer that Independent telephone companies are more carefully and economically conducted than the Bell. Local men of broad business experience constitute their boards of directors and they are in constant close touch with the company's affairs. Another great element of strength consists in the sentiment of the local community, which is as a rule outspokenly and actively favorable to Independent interests.

Viewed from the standpoint of failures, Independent telephone securities are noticeably strong, the per cent of failures as compared with other industries being strikingly small. There are in the United States over 700 Independent telephone companies with a capitalization of $350,000,000. Dun and Bradstreet's weekly reports of bank, trust company and commercial failures very rarely include an Independent telephone company.

Losses occur in every branch of business—there is no industry which can boast of absolute safety against reverses. Capital seeking investment with a view of increasing intrinsic as well as market values, earnings, and dividends, stability and permanence, must not overlook Independent telephone securities. A careful investigation will place the stocks and bonds of well-managed companies among the list of high-class securities.

The Independents of the United States own today several hundred thousand miles of toll lines, and have over 3,000,000 telephones in service. They have during the last eight years averaged daily approximately 200 miles of new toll lines with a daily addition of over 1,000 new subscribers to their local exchanges, requiring daily more than $100,000 of new capital, and their future increase can be measured not only by the growth of this growing land of ours, but by the fact that not a single operating company has its present territory fully covered, to say nothing of the numberless cities and towns yet to be built. Over 7,000 Independent telephone companies are now operating in 12,000 cities and villages.

Investors will view with strong approval the present close organization, district, state and national, throughout the United States. The element of security such organization brings is of immense value and capital is thereby assured of the systematic protection of all Independent interests. A continuation of systematic organization means not only increased security and prosperity to individual companies, but increased confidence by the investing public.—*A paper prepared by W. L. Moellering and read before the annual convention of the International Independent Telephone Association.*

HOW TO SOLICIT FOR NEW BUSINESS.

IT is generally the case that the Independent telephone manager who has no Bell opposition has more new business than he can well handle. In many places, however, where the Bell Company has aroused from its sleep of security induced by years of high rates and lack of opposition, and is actually giving decent service at reasonable rates, it is necessary to go after new business by means of personal solicitation.

In order to get the best results, the personal visit should be preceded by at least two letters, mailed a few days apart. The first, designed to awaken the interest of the prospective subscriber, should contain literature describing the office and line equipment in an interesting manner, illustrated by one or two well-chosen cuts, and impressing the recipient with the fact that everything connected with the Independent company is up-to-date. Advertising matter to be of value must be attractive, and poorly printed stuff illustrated by cheap-looking cuts does more harm than good. The second letter should be in the nature of a direct appeal for patronage, and should close with the information that a representative of the company will call on the reader in a few days, thus leaving the way open for a good solicitor to close a contract.

*Secretaries of the various State associations are invited to send all papers bearing on the Independent telephone situation, no matter what the subject may be, direct to the publisher of this magazine. Co-operation of this kind will have a lasting benefit to the industry we are conscientiously endeavoring to serve.

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The line of argument the solicitor should follow in conversation with the prospective subscriber must be governed largely by local conditions. I saw a good point in this connection the other day in an article on soliciting, entitled "Don't knock on your opponent, except as a matter of self-protection." It's a good rule to follow, too. Most people hate a knocker. Tell your man how good your service is, and the advantage it would be to his business, but don't harp on the intolerant service the Bell Company is giving. The chances are the prospective customer already knows about it.

In their eagerness to get business some solicitors are not careful as to the class of people whom they solicit, and as a result the company has left on its hands, occasionally, a worthless contract and several spans of poles and line wire which may perhaps stand idle for months. The people to solicit are the ones who haven't your company's telephone service and who can afford to have it.

An argument that occasionally confronts the Independent solicitor, especially when talking to the business man, is the oft-repeated cry, "You don't reach Chicago, nor Kansas City, nor New York, nor Indianapolis." Of course, we all know that it is only a matter of a year or so until this condition will be a thing of the past, but to the business man this argument must be answered for the present. An answer that will fit a great many cases will be found in the following: It is a great deal less trouble for the average business man to hunt a Bell pay-station for his few calls to or from these far-distant points which he perhaps cannot reach at present on the Independent lines, than it is for him to run in to his neighbor's Independent telephone five or six times a day to call to or answer a call from any of the neighboring towns, in which everybody has an Independent telephone. For we all know that by far the larger per cent of any exchange's toll business is with points within a radius of fifty miles.

The growth of any telephone exchange depends on the quality of its service. The greatest aids to our solicitors are the people who tell their neighbors how much better our service is than that of our competitors, and a list of satisfied subscribers makes more for the success of the business than whole pages of newspaper advertising. Therefore, it is up to us to make our service so much better than the Bell's that it will be a matter of public gossip; and in addition, to keep before the public always the fact that "we don't belong to the trust."—*A paper prepared by W. K. McQuown for the Illinois Independent Telephone Convention, but not read.*

WHERE THE COPPER COMES FROM—MONTANA!

IN the extent and magnitude of her mineral resources, Montana stands pre-eminent and without a peer. First in value and importance of her mineral products is copper, for Montana is truly the state where the copper comes from, and while your finance committees are preparing the budget to take care of the extensions of lines, or improvements of great telephone plants, and wondering how much advance they will have to pay for the next car of copper wire, the millionaire mine owner of Montana is resting secure in the fact that he practically holds the key to the situation, and that the great telephone development that is taking place will add yearly to his boundless wealth and the wealth of the great state of Montana—where the copper comes from. I might dwell glowingly on the great possibilities of Montana's vast output of copper, when as a manufactured product it is utilized in the art of telephony as applied today in this business world, connecting up the various marts of trade and facilitating business and the possibilities of man. I might recite the story of how the poor, laboring, mining engineer of yesterday has become the millionaire mine owner of today—the United States senator of tomorrow who, for pastime, builds Fifth avenue mansions and later, as a railroad builder, does his part in the development of our great west—all this with the income from a copper mine. But of more interest to the members of this convention, and the question you would have me answer, is, "What is the Independent telephone situation in Montana?"

We are as yet in our infancy, but in a brief span of time we feel that wonders have been accomplished. Telephone competition is new in our territory. The pioneer in the Independent telephone development in the state of Montana is P. B. Moss, the noted banker and financier of Billings, who for several years has owned and operated with great success the Mutual Telephone Company's plants in eastern Montana. The territory served by this company has every reason to be proud of the splendid service afforded, and the public has shown its appreciation by patronage far in excess of his competitor, the Bell. In number of telephones in the territory covered, this company has practically double the number of patrons served by its competitor.

Next comes the Home telephone plants, which have all been constructed and put in operation during the past year, in the territory directly west of that occupied by the mutual companies. These plants have all begun giving service during the earlier part of this year, and in point of subscribers served and extent of service, has surpassed all that has been accomplished in the past ten years in this field by the Bell companies. Directly west of these, in the territory of Butte and Helena, plants are now being built by the Montana Independent Telephone Company. Great progress has been made toward completion and it is safe to say that during the next year there will be spent in this territory by these various companies approximately three million dollars in the development of this field. All plants that are now in operation are connected up with the best of copper toll lines; the construction throughout is standard; and with the completion

J. S. Haley.

of construction now under way, it is with pardonable pride we assert that Montana will take a front rank among the Independent telephone states.

Independent telephony in Montana owes much to the efforts of W. H. Crumb & Co., through whose perseverance and labor a decision was secured from the supreme court whereby any telephone or telegraph company is permitted to construct its lines in the towns and cities of the state. The sum total of the situation is that the territory is divided into three sections, each covered by allied companies—the Mutual Telephone Company on the east, the Home telephone companies in the central part and the Montana Independent Company on the west. All of these companies connect for an interchange of business and form a most complete state system.

Taken as a whole, the field has proven a fruitful one. The rates are adequate, making a satisfactory investment. In no case has there been any question of getting the business, but only the proposition of being able to supply the demand. We predict that before another convention meets this will have proven to be the banner field in telephone development.—*Paper read by J. S. Haley before the annual convention of the International Independent Telephone Association.*

THE INDIANA SITUATION.

THE Independent telephone business in Indiana was never stronger nor more firmly intrenched than it is today. While we have been working out the problem of universal telephone service at reasonable rates, we unwittingly developed another problem which we did not even dream, a few years ago, would ever be presented us for solution. But it has been presented, and so far the solution seems to meet the approval of everyone except those who demanded a solution but hoped for a different answer than the one so far given.

This new problem is no other than an unofficial proposition from the Bell interest to stop the telephonic warfare in Indiana by agreeing to abandon its exchanges in certain places and to a merger with the Independents in other places, so that there would be only one exchange, with dual toll line connection, in each community.

In order to understand why the Indiana Independent Telephone Association gave the answer which it did, a brief resume of the facts leading up to the present situation may not be amiss.

The Independent telephone movement has become one of the fixed factors in the commercial and social life of the Hoosier state. Its supremacy is not an accident, but has been attained by means of one of the fiercest commercial battles ever waged on Indiana soil. Like all great struggles for supremacy, the battle itself was not designedly planned at the beginning, but was the outgrowth of the conflict of opposing principles which uniformly manifest themselves in war measures when diplomacy fails.

Thirty years ago the principles of monopoly were so skilfully applied to the telephone business that for twenty years one corporation could truthfully say: "We own the exclusive right to operate the telephone." Having the "exclusive right," the telephone was operated for revenue only, with no thought of efficiency of service or public accommodation. During these twenty years, the Bell company unwittingly prepared the way for future Independent development.

Twelve years ago, a few venturesome individuals in Indiana had the temerity to question the correctness of the theory of monopolistic control, and to apply the principles of Independent ownership and operation to the telephone business.

The Bell telephone corporation, which was busy extending its principles of monopoly to every section of the United States, paid little attention, at first, to the new theory that was being applied to the telephone business in Indiana. But the people, who were beginning to despise monopolization of the telephone business as they despise monopolization of any other business, rallied to the support of the Independents.

At the beginning there was no thought on the part of the Independents of putting the Bell out of business—in fact, they cared not whether the Bell had much or little business. The two things which they sought to establish were local ownership and control of the telephone business, and telephone service for all who wanted it, at reasonable rates. But the Bell soon realized that, if the people were permitted to establish plants upon Independent lines, the principle of monopoly—which is the very foundation of Bell corporate existence—was in danger of being driven from the telephonic field. No one knows better than the "telephone trust" that, under equal federal, state and municipal conditions, its principles of monopoly can not survive Independent opposition.

Realizing that the Independent movement endangered its very foundation, the "telephone trust" declared a piratical war upon the Independent movement, and the Independents struck back as a war measure. This conflict—which has cost millions in money and has sent Bell subsidiary companies into virtual bankruptcy—was brought on by the Bell and not by the Independents. But, being in the fight, the Hoosier state will stay in the fight until the theories of the monopolistic control of the telephone business have been driven once and forever from our borders.

At the beginning of this conflict the opposing forces seemed unequally matched. On the one side was arrayed the gigantic telephone trust, with its exclusive patents, unlimited franchises, and millions in money, backed by Milk street and Wall street financiers. On the other side was a miscellaneous assemblage of a few scattering Independent exchanges, with no patents of value, limited franchises, meagre capital, but backed by the common people. Corporate power and greed for gain bound one side together into a well disciplined army. Fealty to Independent principles and loyalty to right, grouped the other side into a voluntary state association and made it a powerful fighting force.

The two forces in Indiana, as everywhere in the United States, became the exponents of two separate and opposing principles as antagonistic to each other as good and evil or light and darkness.

The American Telephone & Telegraph Company, with its Central Union and Cumberland subsidiary companies, espoused the cause of monopoly. The Indiana Independent Telephone Association, with its 145 member companies, championed the principle of Independent ownership and control of the telephone business.

There is and can be no reconciliation between the two systems. No alliance can be formed in the telephone business which will preserve the two systems and keep alive the principles upon which each is founded, any more than monopoly and independence can be merged into one system in the oil trade, the railroad business, or any other commercial enterprise that is national in scope.

It does not take a seer to see this fact, nor a prophet to tell which system will finally win. No monopoly has ever been more than temporarily successful. In fact, so far as Indiana is concerned, it is no longer a matter of speculation or doubt, for when recently the white flag of truce was unfurled by some of the Bell lieutenants, their superior officers did not cite them to a court martial for any act of disloyalty to the Bell interest.

Twelve years of conflict in Indiana has resulted in the formation of about 400 separate Independent telephone companies; the installation of 200,000 Independent telephones, and the extension of the Independent lines into every county in the state. At the same time the monopoly, having only about one-fourth as many subscribers, acknowledges that it has lost all of its remunerative exchange business in every city in the state with the single exception of Evansville. While it has sunk millions in its futile campaign of extermination, it freely confesses that it is in worse financial condition in Indiana than every before; and makes the bold admission, in its tax report, that it has not paid a dividend since 1896, and that none is in sight.

This is probably the reason why six of the field agents and division superintendents of the Central Union Telephone Company appeared at a joint meeting of the first, second and third districts of the Indiana association, at Logansport, on the 28th of March, and made a written proposition to abandon, sell, lease or merge its exchange property, wherever there was competition in these districts, and thereafter to connect the Bell toll lines

Charles S. Norton.

with the remaining Independent exchanges. They also said that they would extend the proposition to cover the entire Central Union territory in Indiana; that the proposition was made with the consent of their superior officials and would be indorsed by the American Telephone & Telegraph Company, which owns 76.76 per cent of the Central Union stock.

These three districts referred the proposition to the state association—first passing a resolution that no proposition should be considered that did not apply equally to the entire state.

Afterward, an unsigned tentative proposition, which did embrace the entire Central Union territory in the state, was presented to the executive committee of the state association.

The executive committee said: "If you mean business and are willing to abandon the exchange business in this state, have your officials sign this proposition, and we will submit it to the association, which meets in regular annual convention at Indianapolis on May 15 and 16.

The executive committee believed that the Independents had had nothing to fear from the Bell, for it goes on the theory that he who can not hold by diplomacy that which he has won at arms ought never to have been a party to the conflict.

The Bell officials, however, did not sign the proposition, and the state association gave no official consideration to the unofficial proposition of the Bell field agents. What their actions mean we leave you to judge for yourselves, but the Indiana association believes that if the Independents in Indian were willing to ignore the effect upon the Independent cause in neighboring states, terms advantageous to the Independents in Indiana could be speedily made with the Central Union Telephone Company.

But the Indiana Independent Telephone Association is loyal to the principles of Independent ownership and control of the telephone business, not only in Indiana, but throughout the United States. We realize that while the corporate existence of our many companies may stop at state lines, the principle upon which we are founded extends throughout the nation. Our fealty to you of other states is not because you are in the telephone business, but because you, like ourselves, are fighting for the rights of the people and against the greed of a monopoly.

Our association, fearing the monopoly might think we were willing to temporize with it in Indiana, while it was trying to crush our brethren in Ohio, Wisconsin and other states, and to

present as solid a front in diplomacy as it has in warfare, amended its constitution so as to make ineligible to membership any company having a Bell connection, and to cause any present member making a future connection with the Bell to forfeit its membership.

We stand, today, a solid phalanx of 145 separate companies, controlling nine-tenths of the Independent telephone business of Indiana, and opposing, not the Central Union Telephone Company, nor the American Telephone & Telegraph Company, as individual companies, but the principle of monopoly, and these companies in so far as they are the exponents of that principle.

We realize that if the Bell subsidiary companies could be freed from the parent company's control, these companies would then be founded upon the same basis as our own Independent companies, and we would deal with them as allies or competitors as their interest might harmonize or conflict with our own—just as we deal with other Independent companies. But, as long as monopoly is the controlling principle of the companies forming the Bell system, they can not be allies; they are not competitors, but are a piratical enemy to every Independent company.

There will always be more or less competition in the telephone business, dependent entirely upon conditions which may or may not necessitate competition. The same conditions that govern competition and absence of competition in other lines of business will ultimately control in the telephone field.

The telephone is no more a natural monopoly than railroading or the printing of newspapers is a natural monopoly. A town that can support only one newspaper need not hope for competition in the price of newspapers or in advertising rates. If a city is large enough to support two daily papers, the merchant in that city who desires to reach all the people with his advertisement must patronize the advertising columns of both papers and pay for both. No one newspaper or railroad can adequately serve the public in our larger cities. It is a mechanical and human impossibility. It may serve them properly in the smaller cities and towns, where conditions are different.

So with the telephone business. While one company may answer all of the requirements of the towns and smaller cities, no one company can ever properly serve cities like Chicago, New York, Boston, St. Louis and Indianapolis. If it is attempted, and municipal authorities refuse to allow competition, rest assured that the public will pay an exorbitant rate for inferior service, whether it be Bell or Independent.

As the lime light of publicity has recently been turned on the telephone situation in Indiana because the Independent Association deigned to match its diplomacy with that of an enemy whom it had defeated in conflict, it is well that other states know Indiana's position in this matter.

We believe in competition in the telephone business where conditions are such that competition is necessary to secure adequate service at reasonable rates. We do not believe in the monopolization of *all* telephone business by one corporation under any condition. We believe that, when only one telephone company is necessary, it should be locally and independently owned and controlled. We are not averse to arranging with the Central Union Telephone Company and the American Telephone & Telegraph Company for joint service, whenever these corporations are ready to abandon their principles of monopoly and deal with the Independents on equal terms wherever they may be found throughout the United States.

Until the "telephone trust" will agree to deal as fairly with you of other states as it has agreed to do with Indiana, the Indiana Independent Telephone Association will reject any and all propositions for an alliance in the Hoosier state, for Indiana is no traitor to this, the greatest commercial propaganda of the twentieth century—the Independent telephone movement.—*Paper read by Charles S. Norton before the annual convention of the International Independent Telephone Association.*

LONG DISTANCE SERVICE—ITS DEVELOPMENT AND POSSIBILITIES.

YOUR committee assigned me this subject and then said, "Be brief." I wonder if they realized that long distance service started in Noah's time and has possibilities for the future till the blowing of Gabriel's horn. Noah seems to have been the original traffic manager and, I think, sent and received a reply to the first long distance message on record. Twice he had to say to his subscribers, "No circuit," but finally the line was clear, the message sent, and the answer brought good tidings of dry land, sunny days, and a promise of that development of the human race which has continued to the present time and which, we trust, will continue for centuries to come. From then until quite recently long distance development was slow and unsatisfactory, but the last ten years has shown a growth so rapid that it is astounding. What the next ten years will bring forth no one dares to prophesy.

The lessons of the past are many. From these lessons let complete and substantial structure that when finished, future generations can say of us that we, too, did our share towards this development and progress which is going on and will continue to go on from year to year and from century to century.

All great movements—social, political or commercial—have in them certain elements of combined strength and weakness; and so it is with the Independent telephone movement. Its strength and its weakness lies in the fact that it represents so many and such diversified interests. Coming as we do from every state in the Union, with stockholders living in every county and almost every city and town in these states, we represent people of all classes—rich and poor, farmer and artisan, banker and clerk—and come nearer representing the entire people than any other convention held in this broad land of ours, with the exception, possibly, of the conventions of our great political parties. This is our strength. Each company managed by its local board of directors, through its secretary, general manager, general superintendent, or whatever you may wish to call him, has ideas of his own—some good, some bad, some indifferent—but always in close touch with local people. Knowing their habits, their needs, and their conditions, we are better able to give satisfactory local exchange and "short haul" long distance service than companies managed and owned by directors and stockholders hundreds of miles away.

Long distance service, however, under this kind of management is not satisfactory. If Johnson, in Illinois, wishes to talk with Jones, in Ohio, or Morgan, in Missouri, he must, to get good results, talk over lines operated under the same schedule of rates, the same time limits for conversation, the same code between operators and, in general terms, built of the same class of construction and with about the same apparatus; and the companies handling his business must be assured that when his message is completed they will each get their share of the "haul."

Here is where we are weak—one company believes in a three-minute time limit, another in five; one says one-half cent a mile is enough, another three-fifths. This company's lines are of copper, that one's mostly iron; this company uses a code designed by its own traffic manager, that one the code of its state association, and the next one no code at all; and so on. What is the result? Confusion, bad service, and dissatisfied subscribers.

Travel follows the best highways, electricity the path of least resistance, telephone traffic the lines of best service and most reasonable rates. To hold our own we must "get busy."

We cannot expect to hold the business of the large manufacturer who wishes to talk with Pittsburg, Cleveland, St. Louis, Kansas City, Minneapolis, Dayton or Oshkosh, unless we can give prompt and satisfactory service. If he uses our competitor's lines for the "long haul" he is likely to do the same for the "short haul." Mind you, I do not claim that this, what might be called "long haul" long distance service, is the most valuable or necessary part of our business; it is not by any means; but at the present time it is what we lack the most in the way of giving complete service to our subscribers, and is one of our competitor's strongest points in holding important commercial institutions that would otherwise like to dispense with its telephone.

"Short haul" long distance messages are, and I believe always will be, a most important factor in the building up of our business and earning profits for our stockholders.

Ninety per cent, at least, of so-called long distance messages go to points within fifty miles of the originating station. There seems to be no limit to business of this character, except probably the limit to the number of circuits. Time and again I have seen new circuits built for the purpose of relieving congested lines, and the result is simply enough more business to make the new line as busy as the old one. Of course there is a limit to this, but few of us have reached it. In communities where there are enough circuits to take care of the ten-cent and fifteen-cent messages as fast as they are sent in, it will be found that the telephone has practically superseded the mail as a medium for carrying on business. The merchant, the manufacturer, the produce dealer, cannot waste his time and the time of his clerks or stenographers in writing letters and waiting for replies when, for ten or fifteen cents and but little more time consumed than in getting a local subscriber, he can get in touch with the party wanted from ten to twenty-five miles away.

Build more lines of this kind. Copper is high, we all realize, but with pole leads already up, new lines can be built at a comparatively low cost, and the investment will bring in surprising returns.

The telephone habit, fed with the proper food, grows and flourishes like a young bay tree. Watch your subscribers' toll bills from month to month, and get after those showing a falling off or only slow gains. Possibly one or two messages to points where service is unsatisfactory has caused your subscriber to condemn your entire system, and a little education will do him worlds of good, and in nine cases out of ten will bring him back to the use of your lines and increase his use of

Trunk lines between the large commercial centers should be built at once; this matter is so essential to the success of the Independent movement that every effort should be made toward development along these lines without any further delay. A careful study of the map of the United States will show that the territory east of Kansas City, almost to the Atlantic ocean, is so filled with Independent exchanges and long distance lines that it is not going to be much of a problem to fill in the necessary gaps and make a long distance system so complete and comprehensive as to be astounding. When this is done, our competitors are going to have a hard time stirring up trouble like they threatened in Indiana a short time ago.

You will find that in nine cases out of ten the Bell company induces local exchange companies either to connect with its lines or to become sub-licensees because the local company does not have enough long distance lines to take care of the business properly, and they think when they connect with the Bell their troubles will be over, but the awakening is generally a sad one. They find, while they are able, possibly, to talk with points five or six hundred miles away better than they were over the Independent lines, that to points in their own state they are more often worse off than they were before. I will venture to say that in the states of Michigan, Indiana and Ohio, and I presume in

C. E. Tarte.

most of the other states, service to points where from ninety to ninety-five per cent of the business is done can be secured with more satisfaction over the lines of the Independent companies than over the Bell; and yet their strongest talking point is what they call their "superior long distance service." Why? Because, as stated before, they undoubtedly beat us out giving service to points five or six hundred miles away, and while only a few of the subscribers to any exchange talk with these far-away points, it still makes a drawing card, and they use it for all it is worth.

Before any larger development can be made, however, traffic associations and clearing houses must be thoroughly organized. Neither companies nor individuals will put their money into lines unless they have positive assurance that they will have their share of the "haul" for all business going over them. This seems such a reasonable and sane proposition that it is almost absurd to make the statement; and yet the lack of appreciation of it is holding back Independent long distance development more than any other factor. As a general proposition, each state should have its own traffic association, and through the clearing house of this association all business inside the state should be handled. This state association should then be affiliated, through its officers, with the traffic associations of neighboring states with which it does most of its business, and these interstate associations should then, through their officers, again form a national traffic association.

Operating rules, codes, time limits, rates (outside of those purely local in each state), and all methods of handling long distance business, etc., etc., would be handled through these associations, and we would then have an organization stronger by far than if we were all in one large company, and still retain the strength that comes with local organizations, local directors and local stockholders.

head and must maneuver, fight and advance under some well-defined rules and tactics. We have the units, we are fighting for a principle, we have won the skirmishes and battles. It is a campaign that we are fighting now, and it calls for organization, thorough and complete. Many of the states are already in line, and others are getting ready. Do it now, and in a short time Independent long distance service will mean "long distance" in every sense of the word.—*Paper read by C. E. Tarte before the annual convention of the International Independent Telephone Association.*

MAKING HISTORY IN THE NORTHWEST.

THE history of every great movement is rendered more conspicuous by the recording of certain incidents which mark the various stages of progress toward the goal whither such a cause is traveling.

Last year with that generosity and spirit of fraternity which characterizes the American nation, you made a new record by amending the title of your association in order that Canadians might be included in your membership. This year you have rendered the occasion conspicuous by including in your program for the first time an address dealing with events beyond the limits of your great republic and in the vast dominion to the north of you.

On behalf of all Canadians, I extend to you the most sincere greetings of good fellowship, the most hearty congratulations upon the work you have already accomplished, and most fervent hope that ever increasing success will crown your efforts in the future until the telephone industry throughout this continent will be permeated with Independence, even as the glorious constitution of which you are so justly proud.

However, I must not forget the text which your worthy president was good enough to assign to me, with the added injunction that I must crowd a great deal of material within the time allotted to me.

"Making History in the Northwest." In order that you may better understand that great territory which has for the past year been attracting so much attention in the telephone world, and the most important part of which has recently formed the arena of one of the greatest contests between the Bell monopoly and the people, I propose giving you a few figures which indicate its great financial and commercial development.

In Manitoba, the premier province of this great northwest, last year sixty-one and a quarter million bushels of wheat was produced on three and a quarter million acres of land by forty-five thousand prosperous farmers. The province still has twenty million acres of virgin prairie open for settlement, capable of producing four hundred million bushels of wheat per annum.

During the last five years the fifteen largest towns which lie between Lake Superior and the Rocky Mountains have increased in population 139 per cent; twenty-six towns of from 1,000 to 3,000 inhabitants have increased 96 per cent; and twenty-nine towns of from 450 to 1,000 people have increased 65 per cent.

Tax assessments have grown from $36,000 to $139,000 per annum. Branch banks have increased from 131 to 473, while the bank clearings in Winnipeg have advanced from $107,000,000 to $504,500,000. The foreign trade of the northwest increased from $20,750,000 to $55,500,000. The exports last year in horses, cattle, sheep, furs, hides, wool, oats, wheat, flour, oatmeal and wood pulp amounting to $63,000,000, of which the United States took $12,000,000. The area of field crops in 1900 was 3,700,000 acres; last year 9,400,000, of which 4,800,000 acres are in Manitoba. Last year there were 1,593 elevators, with a capacity of 65,093,000 bushels, and 52 flour mills capable of turning out 25,000 barrels a day. From 1901 to last year 709,000 emigrants entered the dominion, 239,000 coming from the United States, the majority of which settled in the northwest.

This is a brief review of those western provinces, the inhabitants of which have determined that they will provide themselves with a modern and perfectly developed telephone service without the aid of the Bell monopoly.

Had those responsible for the Canadian Bell Company been wise in their generation, the conditions which exists today in the northwest would be unknown, but with their characteristic apathy and indifference to the people's needs, they turned a deaf ear to the demand of the public for a more extended service until it became necessary for the Manitoba government in 1904 to consider the question of enabling the citizens to perform for themselves that which the monopoly had hitherto refused to do. As an evidence of the failure of the Bell to live up to its responsibilities, I may state that at the beginning of 1905, after thirty-four years of undisputed possession of the field, the monopoly had in Manitoba 5,532 telephones, in Alberta 730,

phones in the capital of each province, the figures will be in Manitoba 1,411, in Alberta 270, and in Saskatchewan 174.

In a community of 800,000 people there was but one telephone to over 119 inhabitants, including the capitals of Winnipeg, Regina and Calgary, and one telephone to over 369 persons outside of those cities.

With a view of securing to the people of Manitoba an adequate telephone service, after much careful thought and personal study on the part of Premier Roblin and his colleagues, the provincial government appointed a committee of the legislature to inquire into telephone conditions elsewhere. This committee, after securing all available information at home, visited the United States and held investigations in Minneapolis, St. Paul, Chicago and Grand Rapids, returning to Winnipeg firmly convinced that what had been accomplished by the Independents could with equal success be achieved by the people of Manitoba.

It was decided, however, in order to completely cover the whole province within a reasonable time and with properly equipped standard service, and more particularly the rural districts, that it was absolutely necessary that such means should be adopted as would secure the requisite capital without difficulty, and at a low rate of interest, which was only possible under

Francis Dagger.

public ownership. Legislation was therefore introduced by Attorney-General Colin H. Campbell and passed by the legislature without dissent, providing that:

1. The government would construct and operate a complete long distance service throughout the province.

2. The government upon request of the city councils would build and operate the exchange system in the cities of Winnipeg, Brandon and Portage La Prairie, where the Bell is most strongly entrenched.

3. That any municipality in which 60 per cent of the rate payers voting upon the question signify their wish to establish and operate a municipal telephone system shall be empowered to do so, and that the necessary capital shall be secured by the issue of municipal bonds bearing the endorsation of the provincial treasurer, guaranteeing on behalf of the government, payment of the interest and repayment of the principal.

In order to give effect to the last named enactment and to counteract a possible guerilla warfare among the municipalities, on the part of the Bell, it was provided that a poll be taken at the municipal elections on December 18 last, in which every rate payer in the province was given the opportunity of voting on the question, "Shall this municipality own and operate its own telephone." A vote in the affirmative gave the council power, subject to the government's approval, to proceed with the work and obtain the necessary capital for construction and extensions from time to time, without any necessity of issuing further by-laws, thereby rendering it impossible for the Bell at any time to harass a municipality in its financing, by influencing the electorate to vote against the issuing of bonds to take care of future growth.

Preparatory to the taking of this vote, the government called upon me to conduct a campaign, which, from the number of meetings held, territory covered, literature distributed, and unanimity of the verdict recorded against the Bell monopoly, is without a parallel in the history of the telephone fight on this continent. In this work I was loyally supported by a corps of representative Independent telephone men from both Canada and the United States.

In speaking of the result of this campaign up to date, I wish to say that, notwithstanding the gratifying nature of the victory already achieved, the influence it will have in freeing the people from the evils of the Bell monopoly throughout the Dominion of Canada, cannot be overestimated.

At the time of taking this vote there were in Manitoba 124 municipalities, in which the Bell had 49 exchanges. These municipalities voting against the continuance of the monopoly represented 36 Bell exchanges, and 9,000 subscribers (including Winnipeg, where the majority was 3 to 1), while those voting against the government's policy represented 13 Bell exchanges and 498 subscribers.

Truly, an undeniable demonstration of the fact that Bell methods had been "weighed in the balance and found wanting." This, gentlemen, was not the verdict of a number of enthusiastic Independent telephone men, or of investors in local telephone companies, and their friends, but just the spontaneous and unbiased judgment of the dwellers in a number of separate communities scattered over several hundred miles of territory.

The government of Manitoba, acting in compliance with the mandate of the people, is preparing to build a complete system of toll lines, comprising approximately 1,500 miles of poll route, to connect the various local exchanges with Winnipeg, just as soon as the municipalities have their systems installed. The government long distance system will connect with the lines of the Tri-State Company of Minneapolis, and thus form a link with the Canadian northwest and the Independent companies on your side of the border.

The government is also making arrangements to commence the construction of a plant in the city of Winnipeg for 10,000 telephones, with an ultimate capacity of 20,000; also one in Brandon for 1,000 telephones, with an ultimate capacity of 5,000, the councils of both these cities having by resolution requested the government to provide these services. Portage La Prairie has not yet made any decision, but the legislation provides that the government will establish a local service in that city, and in all other municipalities in which the telephone by-law did not carry, upon the request of a reasonable number of rate payers. In this way there will be no missing links to the provincial system when it has been completed.

In regard to the municipal town and rural systems, already a number of municipalities are being canvassed for subscribers, and the results to date are most encouraging. In the first municipality canvassed, out of 450 farms, 300 signed contracts at $15 per annum before a single pole had been ordered. In the two neighboring municipalities almost the same proportion of subscribers has been secured. As there are 124 municipalities in the province, it is a matter of simple arithmetic to estimate approximately what the total result will be when the government and the municipalities have completely developed the service. I venture to prophesy that three years hence there will not be less than 50,000 telephones in Manitoba connecting with the provincial long distance lines, instead of the 5,500, which the Bell had when the government inaugurated its present policy.

Time will not permit me to more than touch upon the conditions in the other western provinces east of the Rocky Mountains, but my paper would not be complete without a reference to them. In Alberta, the provincial government has adopted a policy similar to that of Manitoba and has already completed some hundred miles of toll lines, including one between Calgary and Banff, 82 miles. Calgary recently passed by a large majority a by-law voting $120,000 to build and operate a municipal system in that city. Edmonton has been operating a municipal service for two years and will this year install an automatic system for 2,000 telephones. The smaller towns and rural districts in this province will have either municipal or government systems.

In Saskatchewan, the neighbor province of Manitoba, the legislature this year voted $6,000 for preliminary work in regard to telephones, with a view to following the example of Manitoba and Alberta. East of Manitoba to the lakes there are only three cities of importance, viz., Kenora, Fort William and Port Arthur, and each of these municipalities own and operate their telephone systems, there being in the last two cities 1,800 municipal telephones, as compared with 200 Bell subscribers.

In conclusion, I think you will agree with me, gentlemen, that the progressive people of the Canadian west have given unmistakable warning to the Bell to quit their camping ground, and I have no hesitation in saying that five years hence there will not be a telephone in the dominion west of Lake Superior controlled by that monopoly. Instead there will be a complete and modern service with a telephone in every farm house, having local and long distance connection with every village, town and city in the west, and with the Independent systems in the adjoining states over the border, as far as the art of telephony

will permit conversation. In short, we contemplate having a system which in point of good service, moderate rates and complete development, will be unequalled in the whole world.

The people of western Canada have measured swords with the Bell Telephone Company, and enter the contest with absolute confidence as to the result.

Gentlemen, whatever may be the ultimate outcome of the fight which you are so nobly waging in the interests of the people and against monopoly, the Independent movement to the east of us will, I hope, find an added inspiration in the knowledge that:

"Not by eastern windows only,
When daylight comes, floods in the light;
Far back the sun moves slow, how slowly,
But westward look; the land is bright."

—A paper read by F. Dagger before the annual convention of the International Independent Telephone Association.

THE SCRAP BOOK.

I FIND among men that each has some hobby or idea differing from others in the same business. The manager of a telephone plant has many things coming up that others working for him never heard of. In the telephone business the subordinates have but little to worry them and usually take the work easy. The conscientious manager realizes the responsibility thrown upon his shoulders and feels that the success lies mainly in his hands.

A careful man at the head of any system should be in close touch with all the details. Many little things come up every hour that require his attention. The head of the system must necessarily assign the proper person to look after some of this work,

B. F. Wasson.

and in many instances he must see that the work has been done. So many employes do not see the things they should and in many cases when they do they make no note of it and let it go by default, ofttimes costing the company money on account of their negligence.

Those of us who are in the telephone business now have much better opportunities than did those of the earlier days. We not only have our every-day experiences, but have the experiences of others, which should prove very helpful to us. We meet and talk with other men in the same business; we hear papers read and listen to the discussions at our district, state and national conventions, and we read our telephone journals to enlighten us on the different subjects with which we come in contact.

The thoughtful man, whether a manager or not, will invariably look over the articles written on the subject he is studying and clip the matter that pertains to his work. He will arrange these cuttings and classify them in his scrap book. All articles pertaining to one subject should be indexed so they can be easily found; the date it was written should be noted and where it appeared. The author's name is also important, because it is necessary to know who has written the article. We have by means of such a scrap book many articles written on the same subject by different authors.

It is always well to be on the alert; be a student; make yourself useful if you wish to succeed and remember that "knowledge is power" and that each one should strive to reach the top.—*Excerpt from a paper read by B. F. Wasson before the Illinois Independent Telephone Convention.*

HOW TO HANDLE LONG DISTANCE BUSINESS.

THE long distance traffic of the Independent telephone companies is increasing so rapidly that it is crowding the circuit capacity making it somewhat difficult to handle the business in order to get the maximum service over the lines. In order to do this there should be a general system of rules under which the various companies might operate in perfect harmony.

I would suggest that good work can be done along this line by the International Independent Telephone Association adopting a set of rules governing the handling of long distance business and have them printed in book form. The association should be able to furnish these books at small cost to the companies, thus

Frank Hart.

making it possible for the smaller companies, who only require a few books, to secure them without going to the expense of having them printed. By having this association adopt the rules, it would make them an authority and would be the means of settling many a dispute between companies as to the right of lines, etc.

I find that much time is consumed by over-zealous operators, in each trying to get their calls through first. Neither will take the other's call, the subscribers are held up, and the use of the line is taken up by argument that often consumes more time than would be necessary in getting both calls through. This will eventually lead to losing calls on account of busy lines.

I think this is a very important subject and should be taken up by the association and discussed thoroughly. Some action should be taken with the end in view of putting a universal system of rules in force.

I find that the smaller companies who have not long had connections with long distance points are suspicious that they will not get fair treatment and it is much more difficult to get proper service from their operators than from the operators of larger companies who are working under some set of rules.

The rules used by larger companies are nearly uniform. There are cases where the originating operator works up the line to the point desired, while other companies relay the message, and other slight changes, too numerous to mention. The modifications are dependent largely on local conditions. I think better results would be accomplished by a universal system.

Much can be said on the subject of the handling of long distance business, but I consider the rules under which the business is built of too much importance to be lost sight of by minor details.

I submit this subject to the association, hoping that it will consider it of enough importance to discuss and take some action that will lead to the adoption of some universal form of rules.—*Paper read by Frank Hart before the International Independent Telephone Association Annual Convention at Chicago.*

Epitome of the Month

PERSONAL.

W. B. Tompkins has been made assistant manager of the Home Company at Quincy, Ill.

L. L. Martin of Tallula has become manager of the Illinois Telephone Company at Roodhouse, Ill.

A. L. Schuler has resigned his position as local manager of the Wabash Valley Telephone Company at Paris, Ill.

Robert Black has been promoted to the position of manager of the Home Telephone Company at Hattiesburg, Miss.

Judge A. M. Bishop has assumed control of the Duluth telephone exchange. He will put the system in first-class shape.

E. L. Robbins has resigned as manager of the Mutual Telephone Company at Villisca, Iowa. Mr. B. Baker will take his place.

H. M. Perry has resigned as general manager of the Home Telephone Company, Clarksville, Tenn. E. B. Dennison has been chosen for his successor.

B. A. Ball is the new manager of the Gibson Home Telephone Company, Gibson, Ill., succeeding George Schlosser, who leaves this month for Green River, Utah.

Louis T. Nolker, vice-president and treasurer of the Commercial Electric Supply Company, St. Louis, is making an extended pleasure trip through the western and coast states.

H. P. Munger, manager of the Carterville-Herrin Telephone Company, Herrin, Ill., has resigned and will go to Harrisburg to take charge of the Saline county telephone system.

F. H. Stacey, formerly manager of the Westbend Telephone Company, Adair, Iowa, has resigned his position and has accepted the same position with the Adair Mutual Telephone Company.

Ed Piper has been chosen to manage the system of the Kearney Independent Telephone Company, Kearney, Neb. Mr. Piper has been manager of the Avoca Telephone Exchange in Iowa.

W. F. Gradolph and Chas. A. Neill, president and vice-president, respectively, of the Gradolph Electric Company, St. Louis, recently left for Mexico, where tests of new instruments the company is bringing out will be made.

Henry Tideman, president of the Menominee Electric Company and the Menominee Insulated Electric Wire Company, is sojourning in Germany. SOUND WAVES learns with regret that Mr. Tideman's health is not the best and he is seeking rest in his native land.

S. A. McKie, for several years manager of the Independent Telephone Company's exchange and system in Taylor, Tex., has resigned to take charge of the exchange and business for the same company at Brownwood. Mr. McKie is succeeded at Taylor by H. L. Manor of Oklahoma City, Okla.

John Sheridan, for many years wire chief of the El Paso Telephone Company, Mt. Pulaski, Ill., has come to Mt. Pulaski, where he is interested in a new telephone company now being organized.
Company, has gone to Mt. Pulaski, Ill., where he is interested in a new telephone company now being organized.

Edward J. Jeep has but recently accepted the position of advertising manager of the Wesco Supply Company, St. Louis, succeeding H. P. Didricksen. Mr. Didricksen goes to South Bend, Ind., as sales manager of the Long Distance Telephone Manufacturing Company. Mr. Jeep returns to the Wesco after a four years' service with Ewing-Merkle Electric Company.

J. F. Morgan on June 1 left the services of the Consolidated Telephone Companies of Pennsylvania to become manager of the branch established at Hazleton by the Thomas Engineering Company of Allentown. Mr. Morgan has been with the Consolidated for eight years, and much of the extraordinary development of the company's business in Allentown is due to his energy.

NEW COMPANIES.

IOWA, La.—The Iowa Telephone Company has been incorporated.

BAGLEY, Ia.—The Mutual Telephone Company has been incorporated, with a capital stock of $9,990.

CAMPBELL, Neb.—The Campbell Telephone Company has been incorporated, with a capital stock of $7,000.

WESLEY, Ia.—The Wesley Rural Telephone Company has been incorporated, with a capital stock of $2,000.

SHELDAHL, Ia.—The Sheldahl Telephone Company has been incorporated, with a capital stock of $6,000.

WANTI, Utah.—The Wanti Telephone Company has recently been incorporated, with a capital stock of $10,000.

WOODBINE, Ia.—The Woodbine Telephone Company has been incorporated, with a capital stock of $50,000.

FULTON, Ind.—The Germany Mutual Telephone Company has been incorporated, with a capital stock of $1,000.

MAYFIELD, Ky.—The Panther Creek Telephone Company has been incorporated, with a capital stock of $2,000.

COLEBROOK, N. H.—The Southern Coos Telephone Company has been incorporated, with a capital stock of $10,000.

GLADWIN, Mich.—The Gladwin County Telephone Company has been incorporated, with a capital stock of $50,000.

HEBRON, Neb.—The Thayer County Telephone Company has been incorporated, with a capital stock of $100,000.

GRAND SALINE, Tex.—The Farmers' Mutual Telephone Company has been organized, with a capital stock of $5,000.

NORWALK, Iowa.—The Norwalk Farmers' Mutual Telephone Company has been incorporated with a capital stock of $5,000.

LEBANON, Va.—The Lebanon Telephone Company has been incorporated, with a capital stock of $3,000, by C. Alderson and others.

DECATUR, Ill.—The Macon County Telephone Company has reorganized, with a capital stock of $250,000. C. S. Hankins, manager.

GAINESVILLE, Ga.—The Clermont & Cleveland Telephone Company has been incorporated by W. D. Autry, T. C. Miller and others.

HOOKER, Okla.—The Hooker Telephone Company has been incorporated, with a capital stock of $20,000, by N. O. Stephenson and others.

LAKE BUTLER, Fla.—The Lake Butler Telephone Company has been organized. Construction work on the new system will begin at once.

OAK GROVE, Va.—The Rappahannock Telephone Company has been formed, with a capital stock of $5,000, by D. H. Griffith and others.

ROSCOE, Pa.—The Roscoe Telephone Company has been granted a charter authorizing a capital of $5,000. W. C. Smith is one of the directors.

BROWNSTOWN, Ind.—The Citizens' Mutual Telephone Company of Jackson County has been incorporated, with a capital stock of $10,000.

ARCOLA, Ill.—The Aerial Transit Telephone Company has been incorporated, with a capital stock of $1,000,000, by Henry McCabe and others.

UNION FURNACE, O.—The New Plymouth Telephone Company has been incorporated, with a capital stock of $1,000, by W. P. Miller and others.

HOPKINSVILLE, Ky.—The Pembroke Home Telephone Company has been incorporated, with a capital stock of $25,000, by R. E. Cooper and others.

KELL, Okla.—The Kell Telephone Company has been incorporated, with a capital stock of $50,000, by P. E. Seasons, F. J. Hawsen and J. H. Hawsen.

JACKSON, Miss.—The Independent Home Telephone Company, Hinds county, has been organized, with a capital stock of $200,000, by N. F. Smith and others.

HOUSTON, Tex.—The Central Texas Telephone Company, of Houston, has been incorporated, with a capital stock of $50,000, by A. D. Foster and W. E. Richards.

TIOGA, N. D.—The Tioga Farmers' Telephone Company has been incorporated, with a capital stock of $8,000, by A. Stakston, J. Isaacson, W. H. Dixon and others.

GLASGOW, Ky.—The Barren River Telephone Company has been incorporated, with a capital stock of $5,000, by Emmet G. Logan, Frank P. Hayes and others.

CRETE, Neb.—The Crete Telephone Company has been incorporated, with a capital stock of $100,000, by F. H. Woods, C. W. Nunemaker, B. G. Miller, and others.

MALONE, Tex.—The Manning Telephone Company has been incorporated, with a capital stock of $15,000, by W. J. Manning, W. R. Alford and H. Henderson.

LOW MOOR, Ia.—The Low Moor Telephone Company has been incorporated, with a capital of $5,000. It plans to build a system and make rural line extensions.

JEFFERSONVILLE, Ind.—An Independent Telephone Company has been organized, and is about to apply for a franchise in this city. J. W. Fortune is actively interested.

GEORGETOWN, Ill.—The Citizens' Telephone Company has been incorporated, with a capital stock of $2,500, by Albert Sanders, Jerome Pribble and Jesse H. Lamay.

DISWOOD, Ill.—The Diswood Independent Telephone Company has been incorporated, with a capital stock of $2,000, by D. L. Hesley, L. H. Vick and Wm. McGrite.

WILTON, N. D.—The Farmers' Mutual Telephone Company has been incorporated, with the following directors: C. B. Flinn, George Mathison, W. O. Miller and others.

BLACK MOUNTAIN, N. C.—The Black Mountain Telephone Company has been incorporated, with a capital stock of $50,000, by J. D. Murphy, J. H. Tucker and M. R. Reed.

GRANTSBURG, Wis.—The Farmers' Independent Telephone Company has been incorporated, with a capital stock of $4,000, by R. J. Meland, F. R. Huth and Levi Anderson.

EVANT, Texas.—The Peoples Telephone company has been incorporated with a capital stock of $4,000. The incorporators are: A. Wurts, A. W. Thorne and E. E. Watson.

SYLVANIA, O.—The Citizens' Telephone Company has been incorporated, with a capital stock of $10,000, by F. J. Maisen, J. G. Lauer, R. J. Shinney and Anthony Lauer.

UNION MILLS, Ind.—The Northern Indiana Telephone Company has been incorporated, with a capital stock of $10,000, by F. B. Lesourd, L. T. Quigley and Alva Stephenson.

BROOKSVILLE, Ky.—Articles of incorporation have been filed by the Bracken County Telephone Company, increasing the amount of its capital stock from $10,000 to $20,000.

CHEYENNE WELLS, Colo.—The Cheyenne County Telephone Company has been organized, with a capital stock of $3,000, by H. Y. Tarwater, J. W. P. Love and H. H. Letz.

BRANDON, Miss.—The Brandon and Daniel Telephone Company has been incorporated, with a capital stock of $10,000, by V. H. Russell, H. A. Jones, W. H. Patrick and others.

FAIRFIELD, Ky.—The People's Telephone Company has been incorporated, with a capital stock of $2,000. Newton Pitt, J. L. Bridwell and J. G. Powers are the incorporators.

EL RENO, Okla.—The Midland Telephone Company has been incorporated, with a capital stock of $2,500. The incorporators are Elmer N. King, Allen Crunpacker and others.

WEYERHAUSER, Wis.—The Weyerhauser & Island Lake Telephone Company has been incorporated, with a capital stock of $3,000, by R. J. Erickson, C. J. Muehle and W. C. Dole.

CHIPPEWA FALLS, Wis.—The Lake Hallie Telephone Company has been incorporated at LaFayette, a town near here, and a line eight miles long will at once be constructed to this city.

JEFFERSONVILLE, Ky.—The Home Telephone Company has been incorporated by J. W. Fortune and others. It has been granted a franchise to operate a telephone system at this place.

SEYMOUR, Ind.—The Citizens' Mutual Telephone Company, covering a territory of eight counties, Jackson county being the center, has been incorporated, with a capital stock of $10,000.

ARTHUR, Ill.—The Arthur Mutual Telephone & Telegraph Company has been incorporated, with a capital stock of $20,000. The incorporators are: Marion Watson, H. Jenne and J. B. Craig.

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BRUCE, Wis.—The Murray Farmers' Telephone Company has been incorporated, with a capital stock of $5,000. The incorporators are B. F. Brainerd, F. S. McKean and E. F. Brainerd.

MANITOU, Okla.—The Holton Union Telephone Company has been incorporated, with a capital stock of $640. The incorporators are P. P. Barlow, A. T. Fryer and J. N. Montgomery.

COLUMBIA, Tenn.—The Citizens' Telephone Company will reorganize, with a capital stock of $75,000. The new company will establish a series of up-to-date exchanges throughout the county.

PERSIA, Ia.—The Persia Mutual Telephone Company has been incorporated, with a capital stock of $10,000, by E. C. Campbell, H. A. Moss, I. W. Evans, W. V. Hilbron and M. H. Baker.

HORTON, Kans.—A Mutual Telephone Company has been organized at this place, in order to get connection with the farmer companies on all sides of the town. The capital stock is $25,000.

MUNISING, Mich.—An Independent Telephone Company has been formed here. A franchise has been secured by Dr. G. A. Trueman, and work on the system will be commenced at once.

EL PASO, Ill.—The Panola Independent Telephone Company has been incorporated, with a capital stock of $500. The incorporators are: Joseph Hause, William Burroughs and George Pinkham.

WOLF LAKE, Ind.—The Farmers' Mutual Telephone Company has been incorporated, to construct a telephone system here. Connections will be made with the farmers' system in Whitley county.

WATERTOWN, Wis.—The Watertown Telephone Company has been incorporated, with a capital stock of $25,000. Incorporators are: O. C. Wertheimer, J. F. Prentiss and W. H. Woodward.

HIGGINSPORT, O.—The Higginsport Independent Telephone Company, with a capital stock of $10,000, has been incorporated by Wesley Love, Clinton Stout, D. C. Warner, H. D. Ellis and others.

SYMSONIA, Ky.—The Symsonia Telephone Company of Graves County has been incorporated, with a capital stock of $2,000. The incorporators are: B. A. Wallace, J. H. Wallace and J. T. Draffen.

STEAMBURG, N. Y.—The Seneca Independent Telephone Company has been incorporated, with a capital stock of $10,000. Officers are: W. W. Gates, president; H. C. Gates, secretary and treasurer.

EUBANK, Ky.—The Eubank Farmers' Telephone Company of Pulaski County has been incorporated, with a capital stock of $5,000. The incorporators are A. L. Wilder, J. A. Lee and T. J. Acton.

HOWARD, N. Y.—The Howard & Hornell Telephone Company has been incorporated, with a capital stock of $740, and the following directors elected: W. B. Alden, I. S. Goff, L. I. Sharp, Howard.

CIMARRON, N. M.—The Cimarron Valley Telephone Company, Colfax county, has been formed, with a capital stock of $100,000. The incorporators are David B. Cole, Charles Springer and G. E. Reynolds.

CARTHAGE, Tenn.—The Round Lick Telephone Company, Smith county, has been incorporated, with a capital stock of $1,000, by N. A. Neal, E. A. Kennedy, R. E. Cooksey, A. F. Tuggle and C. A. Shaver.

ALEDO, Ill.—The People's Telephone Company has organized and elected the following officers: Dr. M. G. Reynolds, president; Wilson P. Zentmire, vice-president; Wm. McManus, secretary and treasurer.

DRIFTWOOD, Okla.—The Citizens' Telephone Company has been incorporated, with a capital stock of $3,500, by H. J. Kraigh, J. W. Gass, A. C. Hoeffer, W. E. Barkley, W. H. Cloyd and S. C. Lambert.

BURLINGTON, Okla.—The North Union Telephone Company has been incorporated, with a capital stock of $10,500, by Henry Walsh, T. Morgan, William Mahoney, Frank Veach, Joseph Fash and L. B. Grant.

CULLOM, Ill.—The Vermilion Mutual Telephone Company, No. 2, has been incorporated, with a capital stock of $1,500. The incorporators are: John Diebel, Charles Donnely, Wm. France and Leonard Haag.

PALISADES PARK, N. J.—The Radio Telephone Company, with a capital stock of $2,000,000, has been incorporated by Lee De Forest, Samuel E. Darby, Henry Froukel, Walter J. Scott and Fred W. Southemer.

DALLAS, Ia.—The Dallas Mutual Telephone Company has been incorporated, with a capital stock of $1,000. J. H. Friday, president; H. Hartz, vice-president; J. L. Goering, secretary; Wm. Schrader, treasurer.

DACRE, Renfrew County, Ont.—The Brougham & Grattan Telephone Company has been organized, with a capital stock of $5,000. Provincial directors. Joseph Legree, Phillip Bradley, Robert Steel and others.

SALEM, S. D.—The farmers northeast of Salem have organized a telephone company, to be known as the Center Telephone Company, and will build lines which will connect them with Salem and other points.

SERGEANT BLUFFS, Ia.—The Sergeant Bluffs Telephone Company has been incorporated, with a capital stock of $20,000. Incorporators are: George S. Parker, R. D. Westfall, Wm. Milchrist and J. A. Duncan.

LONG EDDY, N. Y.—Delaware & Sullivan Telephone & Telegraph Company has been incorporated, with a capital stock of $10,000. The incorporators are J. T. Male, H. W. McKoon, A. M. Chandler and others.

PENAWAWA, Wash.—The Penawawa Telephone Company has filed articles of incorporation, with a capital stock of $2,500. The incorporators are Silas M. Smith, W. F. Adams, H. S. Smith, F. A. Lee and Miles Champlin.

INDIAN CREEK, Tex.—The Indian Creek Telephone Company, Bowie county, has been incorporated, with a capital stock of $2,000, by H. J. McBride, Zac Martin, T. N. Ford, G. G. Chambers, Lewis Hones and C. A. Line.

PRATTSVILLE, N. Y.—The Johnson Hollow Telephone Company has been incorporated, with a capital stock of $500, and the following directors elected: Jacob Latz, M. T. Speenburgh, S. P. Ives, Roxbury, Delaware county.

WATERLOO, Okla.—Waterloo Rural Telephone Company has been incorporated, with a capital stock of $500, by A. S. Reed, A. W. Maker, J. J. Hubble, J. M. George and A. L. Lynn, of Waterloo; Charles White of Guthrie.

SANTA MONICA, Cal.—The Santa Monica Bay Home Telephone Company has been incorporated, with a capital stock of $500,000. The following directors were elected: T. H. Dudley, W. S. Vawter, L. Blankenhorn and others.

MANTI, Utah.—The Manti Telephone Company has been incorporated, with a capital stock of $10,000. The officers elected are: A. H. Christensen, president; A. O. Anderson, vice-president; E. D. Sorenson, secretary and treasurer.

MINNEWAUKON, N. D.—The Fillmore Farmers' Telephone Company has been organized and the work of construction will begin at once. The officers are: Ole Vold, president; John Steenerson, treasurer; B. S. Amdahl, secretary.

BARRYVILLE, N. Y.—The Empire & Keystone Telephone Company has been incorporated, with a capital stock of $10,000. Incorporators: Alono A. Calkin, Monticello; Wm. H. Wilson, Eldred; Fred F. Freeman, Barryville, and others.

FALMOUTH, Ind.—The Falmouth Mutual Telephone Company has increased its capital stock from $5,000 to $25,000. The purpose of securing additional capital is to extend the lines and improve the system. Thomas Powell is president.

GUTHRIE, Okla.—The Guthrie, Camp Russell and Northeastern Rural Telephone Company has been incorporated, with a capital stock of $1,300, and the following directors: Shelton Morris, T. L. Hutchinson and Fred Storim, all of Guthrie.

COX'S LANDING, W. Va.—The Cabell-Mason Telephone Company has been incorporated, with a capital stock of $5,000, by R. F. Brammer, N. J. Cox, Cox's Landing; H. V. Sanns, Lesage; H. W. Carson, Laclede; Azel McCurdy, Huntington.

COGSWELL, N. D.—The Cogswell Rural Telephone Company has been incorporated, with a capital stock of $2.500. Incorporators: F. F. Pollock, B. R. Fulton, L. E. Cole, B. R. McCarthy, of Cogswell, and W. S. Jeffries, of Harlem, N. D.

LANYON, Ia.—The Lanyon Mutual Telephone Company has been incorporated, with a capital stock of $5,005, by G. T. Peterson, J. Albert Anderson, Gust Burge, J. A. Burnam, Edward Peterson, D. E. Carlson, Limas Goodale and I. L. Reedholm.

YELLVILLE, Ark.—The G. A. Ward Telephone Company has been organized and the lines will connect Yellville with Cotter, Harrison, Marshall and Leslie. J. D. Sims, president; G. A. Ward, secretary and general manager; W. S. Tegarden, treasurer.

PARKERSBURG, W. Va.—The Rural Telephone Company has been incorporated, with a capital stock of $10,000. The incorporators are E. D. Ball, of Elizabeth; F. L. Hopkins, of Palestine; P. B. Van Horn, of Toppins Grove, and F. C. Merrell, of Parkersburg.

UNION, N. D.—The farmers in the southern part of Grand Forks county have organized the Union Rural Telephone Company. H. T. Ellesson was elected president; George Florence, vice-president; Peter Thornsedt, secretary, and John Arndt, treasurer.

TRIBBEY, Okla.—The Tribbey-Mardock Farmers' Union Telephone Company has been incorporated, with a capital stock of $5,000. Incorporators: R. M. Fowler, W. L. Bean and P. Beaulort, of Irondale; C. L. Austin, J. A. Dunbar and J. J. Roberts, of Tribbey.

NORMAN, Neb.—The Kearney County Independent Telephone Company has been organized, with a capital stock of $15,000, and the following officers elected: A. M. Anderson, president; I. H. Slater, vice-president; J. F. Barnes, secretary; G. P. Kingsley, treasurer.

LEITCHFIELD, Ky.—The Independent Telephone Company has been formed by local men, and will complete an exchange at this place and construct farmer lines throughout the country, connecting them with Independent exchanges in Hardin and Breckinridge counties.

GOULD, Mont.—The Gould-Lincoln Telephone Company filed articles of incorporation with the Secretary of State, A. N. Yoder. The incorporators are H. L. Miller, J. A. Russell and R. R. Johnson, all of Gould. The company has an authorized capital stock of $10,000.

MOOREFIELD, Ark.—An Independent Telephone Company, to be known as the Moorefield Telephone Company, has been organized in this city by F. M. Ham, M. E. Moore, J. M. Duncan, D. B. Conine and others. The company intends to construct a line from Moorefield at Batesville.

BERLIN CENTER, O.—The Berlin Center Telephone Company has been incorporated, with a capital stock of $10,000. The incorporators are W. K. Hughes, W. H. Kale, S. S. Best and H. J. Woolf. The company will operate in Berlin, Jackson, Ellsworth, Canfield and Milton townships.

BLUNT, S. D.—The People's Telephone Company has been incorporated and contemplates the installation of an exchange at Blunt, and the construction of rural lines. The capital stock is $25,000, and the incorporators are C. E. Granger, J. A. Howard, J. H. Dowing and W. W. Waite.

SPRING HILL, Tenn.—The Citizens' Telephone Companv has been organized for the purpose of building a telephone and telegraph line from Jones Valley to Spring Hill. The capital stock is $50,000. Incorporators: Messrs. J. L. Hutton, J. A. Smiser, R. C. Church, Flenn Thomas and others.

MT. AIRY, N. C.—The Mt. Airy Telephone Company, which was organized some time ago, has filed articles of incorporation, and will install and operate a local and long distance telephone system. The capital stock is $50,000. The incorporators are E. C. Hines, J. A. Hadley, W. E. Merrim and others.

GAINSBORO, Tenn.—The Jackson County Home Telephone Company has been incorporated, with a capital stock of $1,500. The officers are: E. McCauley, president, Roughpoint; James S. Ray, vice-president, Roughpoint; J. M. Dean, secretary, Bagdad; L. J. Hix, Roughpoint; J. L. McCarven, manager, Dycus.

NEWPORT, Va.—An Independent Telephone Company is being organized at this city, whose intention it is to establish a local system and to build lines to Hampton, Phoebus and other points. John R. Rowe is actively interested in the new enterprise, and a considerable amount has already been subscribed.

EAST BRADY, Pa.—The Allegheny Valley Telephone Company has been incorporated, with a capital stock of $8,000. The incorporators are: R. A. Thomas, C. Hewer, F. L. Ludwick, J. W. Hill, C. P. McCafferty, T. G. Jones' Sons, R. W. Steele, of East Brady; E. D. Jennings, W. L. Meldren and E. M. Queen, Queenstown.

LYRA, O.—The Lyra Independent Telephone Company has been organized and the following officers elected: M. W. Bandy, president; C. E. Hayward, secretary; Tiffin S. Collett, treasurer. The company will build lines from Lyra to South Webster and will connect with the Home Telephone Company's plant at Wheelersburg.

OAKLAND, Iowa.—The Botna Valley Farmers' and Merchants' Mutual Telephone Company has filed articles of incorporations with a capital stock of $15,000. Officers: Joshua H. Spalti, president; J. N. Maguire, treasurer; W. W. McRory, viec-president; George B. Clarke, secretary. Directors: B. D. Orton, L. C. Hannah, D. S. Pleak and Titus Fehr .

BLANCHESTER, O.—The Farmers' Mutual Telephone Company has been organized in the vicinity of Butlerville, and the following officers elected: E. H. Smith, president; Jesse Spurling, treasurer; Thomas Sharp, secretary. The company's exchange is to be located at Butlerville, and lines will be built to Pleasant Plain, Rossburg, Level, Middleboro and Blanchester.

IRVINE, Ky.—The Irvine Telephone Company has been organized, with a capital stock of $2,000, and articles of incorporation are to be filed at once. The officers of the company are Thomas Williams, president; James A. Wallace, vice-president; Hugh Riddell, secretary; O. W. Witt, treasurer. An exchange is to be installed here and lines built into the surrounding country.

Boston, Mass.—The Metropolitan Home Telephone Company, which holds the Boston franchise, has been formally organized. The stockholders elected the following board of directors: Col. Albert Clarke, James G. Ferguson, Roger G. Miley and Albert L. Ireland, from which were chosen the following officers: Col. Albert Clarke, president, and Albert L. Ireland, vice-president.

Woodstock, Vt.—The Southern Vermont Telephone Company has been incorporated, with a capital stock of $5,000. The company will operate lines through the counties of Windham, Windsor and Bennington. The incorporators are: Winfred Perkins, Berthel; Forest A. Richmond, Woodstock; Francis C. Whitmore, Boston; L. Glynn Lyman, Hartford, and Harry Hoye, Woodstock.

ELECTION OF OFFICERS.

Linwood, Neb.—The directors elected for the Linwood Telephone Company are as follows: M. J. Rezac, Charles Homalka and John Kucera.

White Cloud, Mich.—At a meeting held by the Marengo Prairie Farmers' Telephone Company George Gorman was elected secretary for the ensuing year.

Hecla, S. D.—At a meeting of the Social Telephone Company, held recently, all the old officers were re-elected with exceptions of Vice-President Beerline and Director Bingham.

Newago, Mich.—The following officers have been elected by the Marengo Telephone Company: E. L. Hornbeck, president; George Gorman, secretary; M. H. Angervine, treasurer.

Euclid, Minn.—The following officers have been elected by the Euclid Telephone Company: J. S. Chapin, president; Gerret Smith, vice-president; F. Mitchell, secretary and treasurer.

Santa Fe, N. M.—At the annual meeting of the New Mexico Telephone Company the following officers were elected: W. H. Warner, president; J. P. Victory, secretary and treasurer.

Hunter, N. Y.—The Schorie Valley Telephone Company has elected the following officers: John Sickles, president; N. Wesley Ploss, vice-president; Geo. W. Dunham, secretary; Frank C. Carr, treasurer.

Maclelland, Iowa.—The Maclelland Telephone Association has elected the following officers: John S. Ordway, president; M. S. Gordon, vice-president; W. H. Dermody, secretary; W. H. Waples, treasurer.

Reddick, Ill.—The stockholders of the Reddick Mutual Telephone Company held their annual meeting and elected the following directors: R. L. Goll, F. L. Reik, John Fritz and George Weimer and others.

Cohoes, N. Y.—The Cohoes-Waterford Home Telephone Company has elected the following officers and directors: J. H. Shine, president; I. H. Griswold, vice-president; Geo. R. Wilson, secretary-treasurer.

Villisca, Iowa.—At a recent meeting of the stockholders of the Farmers' Mutual Telephone Company the following officers were elected: L. F. Query, president; L. F. Brownlee, secretary; G. W. Baker, treasurer.

Twelve-Mile Prairie, Ind.—The Twelve-Mile Prairie Telephone Company has elected the following officers: C. T. Stookey, president; W. H. Hill, vice-president; A. M. Carr, secretary; Warren Hill, treasurer.

Albany, N. Y.—The stockholders of the Home Telephone Company, at their annual meeting, elected the following directors: James Moore, Wm. H. Keeler, Howard Hendrickson, Sam B. Rawson and Harry H. Bendy.

Enterprise, Kas.—At the annual meeting of the Brownlow Telephone Company the following officers were elected for the ensuing year: S. S. Peebler, president; W. H. Baker, secretary; F. H. Comstock, treasurer.

Unionville, Pa.—The Brush Creek Telephone Company, recently organized, has elected the following officers: H. W. Brenner, president; J. D. Zahn, vice-president; J. A. Auld, secretary; Ira J. Goehring, treasurer.

Wilmar, Minn.—At the annual meeting of the Kandiyohi County Telephone Company the following officers were chosen: J. O. Lundberg, president; F. C. Peterson, secretary and manager; F. G. Handy, treasurer.

Chardon, Ohio.—The Chardon Telephone Company has elected the following officers for the ensuing year: Orange Pomeroy, president; Andrew Warner, vice-president; U. C. Parsons, secretary; S. S. Smith, treasurer.

Eureka, Ind.—At the meeting of the stockholders of the Luce & Ohio Township Telephone Company the following directors were elected: J. C. Haines, C. B. Laird, Loren F. Gage, Allen J. Payton, Jacob Weber and Halbruge.

Elgin, Neb.—At the annual meeting of the Antelope County Mutual Telephone company the following directors were elected for the ensuing year: B. M. Macauley, Chas. Green, Cal. Stevens, Geo. N. Mead and M. H. Shay.

Fisher, Ill.—At a recent meeting of the stockholders of the Independent Telephone Company, recently organized, the following officers were elected: L. D. Oliver, president; J. N. Boyd, secretary; J. O. Sayers, treasurer.

Belle Plaine, Iowa.—The Irving Mutual Telephone Company held its anuual meeting, re-electing the same officers. Joe Weymer, president; F. L. Marsh, vice-president; S. A. McCandless, secretary, and A. F. Beck, treasurer.

Schenectady, N. Y.—The following officers have been elected by the Schenectady Home Telephone Company: Chas. F. Veeder, president; I .H. Griswold, vice-president; E. S. Kellogg, treasurer; J. T. Bellanger, secretary and manager.

Comfrey, Minn.—At the annual meeting or the Comfrey Rural Telephone Company the following officers were elected: Dr. Prim, president; M. B. Harrison, vice-president; C. L. Lindorsmith, secretary; Oscar Erickson, treasurer.

Washtucna, Wash.—At the annual meeting of the stockholders of the Ritzville-Washtucna High-Line Telephone Company the following officers were elected: Wm. Snyder, president; O. Leonard, secretary; E. H. Herring, treasurer.

Germantown, Ohio.—At a meeting of the stockholders of the Germantown Telephone Company the following directors were re-elected: John C. Schaeffer. C. W. Hildabolt, Charles T. Emminger, John Pflinspach and Geo. L. Coleman.

St. Joseph, Mich.—At a recent meeting of the Twin City Telephone Company the following officers were elected: W. A. Preston, president; N. C. Kingsbury, vice-president; W. R. Mizner, secretary; W. H. Badour, treasurer and manager.

Staunton, Va.—The Augusta Telephone Association at a recent meeting elected the following officers: J. W. Churchman, president; A. H. McCue and M. Bruce Whitmore, vice-presidents; H. N. Baylor, treasurer; John W. Todd, secretary.

Milan, Minn.—At the annual meeting of the Milan Mutual Telephone Company the following officers were re-elected for another term: L. H. Dalen, president; H. H. Sorenson, vice-president; A. O. Christenson, secretary; T. Johnson, treasurer.

Bluffton, Ind.—At the annual meeting of the German Telephone Company the following officers were elected: John Barger, president; William Benika, vice-president; D. C. Huffman, secretary; Robert Stewart, treasurer; Jesse Stoneburner, manager.

Kewanee, Ill.—The Kewanee Home Telephone Company elected the following officers at its annual meeting: W. I. Hibbs, president; F. A. Ellithorp, vice-president; A. C. Shoemaker, secretary and treasurer. All officers are residents of Pittston, Pa.

Hale, Mo.—The Missouri Midland Telephone Company at a recent meeting elected the following officers for the ensuing year: P. C. Green, president; G. A. Marple, secretary and treasurer; L. Bartlett, I. H. Hendricks, Wm. Forsythe, D. Zumbro, directors.

Cozad, Neb.—At the annual meeting of the Cozad Mutual Telephone Company the following directors were elected: W. T. Mincer, J. B. Hughes and Wm. McLaughlin. The officers elected were: S. Schooley, president; Mr. Bester, secretary and manager.

Nicollet, Minn.—At the annual meeting of the Nicollet County Telephone Company the following officers were elected: M. B. Johnson, president; C. Amundson, vice-president; Dr. G. F. Merritt, secretary; F. M. Donahower, treasurer; C. C. Nelson, general manager.

Piggott, Ark.—The Home Telephone Company has elected the following officers: J. K. Browning, president; J. R. Sourlock, secretary and treasurer. The directors are: W. R. Mebane, A. J. Stokes, G. W. Sanders, J. K. Browning, H. W. Moore and J. R. Sourlock.

Silver City, N. M.—The directors of the Silver City, El Paso and Southwestern Telephone Company held a meeting here and elected the following officers: Wm. D. Murray, president; W. E. Baker, vice-president; Clyde Smith, treasurer; J. H. Morgan, manager, El Paso.

Rockwell, Iowa.—At the first annual meeting of the Rockwell Farmers' Telephone Company the following officers were elected: J .M. Brown, president, Bath; J. P. Cahalan, vice-president, Bath; W. A. Storer, secretary, Pleasant Valley, and J. A. McGaheran, Rockwell.

Enon, Mo.—At the annual meeting of the Enon Telephone Company the following officers were elected for the ensuing year: J. H. Fisher, president; J. H. Winkler, vice-president; W. H. Warfield, secretary and treasurer; J. E. Skinner, Theodore Horman and J. H. Winkler, directors.

Dexter, Minn.—At the annual meeting of the Farmers' Telephone Company the following officers were elected: B. F. Tanner, president; Henry Weber, vice-president; R. Rahilly, secretary; O. H. Dickens, treasurer. The directors are: E. Fairbanks, A. S. Rolfson, W. Watson Macnopplin, G. W. King and others.

Moline, Kas.—The Moline Telephone Company elected the following officers at its annual meeting: George O. Harris, president; A. H. Baker, vice-president; U. G. Sutton, secretary; Frank Webb, treasurer. The following directors were elected: G. O. Harris, J. R. Gill, A. H. Baker, Frank Webb, Wm. White and others.

Tremont, Ill.—At the regular annual meeting of the Tazewell County Telephone Company the directors elected officers as follows: President, H. L. Schmetz, Tremont; vice-president, Fred Reuling, Morton; general manager, William Moschel, Morton; secretary and treasurer, G. E. Bird; assistant manager, John Getz, Tremont.

Livingston Manor, N. Y.—At a recent meeting of the Livingston Manor & Beaverkill Telephone Company the following officers were chosen: J. G. Stevens, president; W. R. Woolsey, vice-president; Aaron Ackerly, secretary; J. D. Davidson, treasurer. The company will build a new line from Lew Beach to Livingston Manor.

East Hebron, Me.—The East Hebron Telephone Company has been organized with the following officers: A. M. Fogg, president; A. F. Eastman, vice-president; F. B. Keene, secretary and treasurer; A. F. Eastman, general manager. The construction work will be begun at once from South Buckfield to East Hebron, thence to Hebron Station.

St. John, N. B.—At the annual meeting of the St. Martins Telephone Company it was decided to extend the company's lines to Ten Mile Creek and to have the present telephones removed for those of more modern type. The following officers were elected: C. M. Bostwick, prsident; W. E. Skillen, vice-president; A. D. McMackin, secretary and manager.

Norwalk, Ohio.—At the annuel meeting of the stockholders of the Oil Belt Telephone Company the following directors were elected: Harry E. Graham, Dr. O. H. McDonald, W. W. Graham, E. N. Graham and J. R. McKnight. The directors chose the following officers: Dr. L. H. McDonald, president; W. W. Graham, vice-president, and H. E. Graham, secretary and treasurer.

Wadena, Minn.—At the annual meeting of the Hewitt & Wrightstown Telephone Company the following directors were relected: H. S. Aldrich, J. D. Lifquist, S. F. Deming, Alfred Naylor, A. A. Burtch, B. R. Bartlett and Clarence Joslin, from which were elected the following officers: H. S. Aldrich, president; J. D. Lifquist, vice-president; A .A. Burtch, secretary; B. R. Bartlett, treasurer.

FINANCIAL.

Madison, Ind.—The Madison Telephone Company has issued $50,000 preferred stock.

Windsor, Ohio.—The Windsor Telephone Company has increased its capital stock from $1.500 to $1,875.

Osceola, Wis.—The Osceola Farmers' Mutual Telephone Company has increased its capital stock to $20,000.

Monticello, Mo.—The Citizens' Telephone Company has increased its capital stock from $25,000 to $40,000.

Lawrenceville, Ill.—The Citizens' Telephone Company has increased its capital stock from $20,000 to $40,000.

Bedford, Ind.—The Bedford Home Telephone Company has increased its capital stock from $75,000 to $125,000.

Crestline, Ohio.—The Crestline Local Telephone Company has increased its capital stock from $50,000 to $75,000.

Mt. Pleasant, Tenn.—The Citizens' Telephone Company has increased its capital stock from $18,000 to $50,000.

McDowell, Mo.—The Barry County Mutual Telephone Company has increased its capital stock from $500 to $10,000.

Delta, Ohio.—The Cass County Home Telephone Company has increased its capital stock from $9,750 to $150,000.

Jackson Center, Ohio.—The Jackson Center Telephone Company has increased its capital stock from $25,000 to $40,000.

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JOHNSTOWN, Ohio.—The Johnstown & Groton Telephone Company has increased its capital stock from $50,000 to $80,000.

BLACK RIVER FALLS, Wis.—The Central Wisconsin Telephone Company has increased its capital stock from $50,000 to $100,000.

GEORGETOWN, Ohio.—The Brown County Independent Telephone Company has increased its capital stock from $10,000 to $20,000.

RENTON, Wash.—The Renton Independent Telephone & Telegraph Company has increased its capital stock from $10,000 to $15,000.

WAYLAND, Iowa.—The Wayland Telephone Company has filed amended articles of incorporation, increasing its capital stock to $20,000.

SPARTA, Mo.—The Gordon Telephone Company has filed a certificate showing an increase in its capital stock from $5,000 to $20,000.

NICOLLET, Minn.—At the annual meeting of the Nicollet County Telephone Company the board of directors declared a dividend of 8 per cent.

PLEASANT HILL, Ill.—The Farmers' Mutual Telephone Company of Calhoun and Pike Counties has increased its capital stock from $2,500 to $20,000.

SIOUX CITY, Iowa.—The articles of incorporation of the New State Telephone Company have been amended, increasing the capital stock to $1,000,000.

WINTHROP, Minn.—The People's Independent Telephone Company has increased its capital stock to $50,000 and will construct a number of new rural lines.

NUMIDIA, Pa.—The Roaring Creek Valley Telephone Company, which operates a line between Numidia and Mill Grove, has declared a dividend of 6 per cent.

WINTHROP, Minn.—The People's Independent Telephone Company has increased its capital stock to $50,000. A number of miles of new line will be constructed this year.

MECHANICSBURG, Ohio.—The Mechanicsburg Telephone Company has increased its capital stock from $3,500 to $5,000. D. J. Burnham, president; H. C. Rogers, secretary.

RIMOUSKI, Que.—The Kamouraska Telephone Company has increased its capital stock to $250,000 and has been given power to extend its lines in Rimouski and Matane counties.

SANTA BARBARA, Cal.—The Home Telephone and Telegraph Company has increased its capital stock from $200,000 to $300,000. Edward F. R. Vail, president; A. E. Madison, secretary.

THURSTON, Ohio.—The Buckeye Lake Home Telephone Company has increased its capital stock from $10,000 to $30,000 and intends to extend its service throughout the northern townships of the county.

THREE RIVERS, Mich.—The Three Rivers Telephone Company has increased its capital stock from $50,000 to $100,000. The additional capital will be used in making improvements in the company's system.

HAMILTON, Ohio.—At its recent annual meeting the Hamilton Telephone Company declared a quarterly dividend of 1 per cent. The report shows that the company is very prosperous at the present time.

CARMI, Ill.—The White County Telephone Company has increased its capital stock to $25,000 and is erecting a new exchange building, which will be one of the most up-to-date in the southern part of the state.

DAYTON, Ohio.—The Dayton Home Telephone Company has decided to sell $150,000 of the new preferred stock and the same amount of the common, the proceeds to be used to make improvements and extensions.

BELOIT, Wis.—The Beloit Telephone Company has declared a dividend of six per cent and re-elected the old officers, as follows: M. J. Ward, president; W. H. Grinnell, vice-president; secretary and general manager, Alfred Slater.

SANDWICH, Ill.—At the recent annual meeting of the Northern Illinois Telephone Company, the semi-annual dividend of 3½ per cent was declared and the old officers re-elected, as follows: F. S. Mosher, president; J. N. Antoine, vice-president.

DALE, Ind.—The Farmers' Mutual Telephone Company has been incorporated, with a capital stock of $10,000, by Charles W. Randolph, John Wibbeler, John Meier, Wesley Painter and John Ellis, to be operated for mutual benefit of subscribers who shall be stockholders.

BARTLETT, Tex.—The Bartlett-Walburg Telephone Company has declared a 10 per cent dividend for the last year and elected the following officers for the ensuing year: W. T. Cox, president; J. E. Condra, vice-president; D. R. Irvin, secretary, treasurer and general manager.

NEW ULM, Minn.—The New Ulm Rural Telephone Company, at its annual meeting declared an 8 per cent dividend and elected the following officers for the ensuing year: Fred Pfaender, president; Alex. Russell, vice-president; F. H. Retzlaff, secretary; H. P. Bastian, treasurer.

SAN FRANCISCO, Cal.—The Direct Line Telephone Company has filed amended articles of incorporation reducing its capital stock from $2,500 to $1,000. The directors are Joseph A. Stulz, C. F. Runyon, Julius Fay, Robert Capelle, Geo. W. Emmons, A. K. Andraine and Wm. B. Pringle.

TAMPICO, Ill.—At a meeting of the Tampico Farmers' Mutual Telephone Company the capital stock was raised from $6,000 to $10,000, and the switching fees were raised to $5. All the old officers were elected except the secretary and treasurer, Geo. Isherwood being elected to fill the two offices.

COLUMBUS, Ohio.—At a special meeting of the stockholders of the Columbus Citizens' Telephone Company the capital stock was increased to $1,760,000 by the issue of $500,000 of 6 per cent cumulative preferred stock. Reports showed that the company has now 12,500 telephones, an increase of 50 per cent in 15 months.

MACON, Mo.—Theodore Gary is organizing an investment company for the purpose of perpetuating his large telephone business and to provide funds to take care of the expanding business of the several companies he is interested in. The capital stock is $200,000. The assets of the new company will be composed mostly of the controlling interest of stock in all the companies.

LARNES, Kas.—The Ash Valley Telephone Company, operating six farmer lines, has entered into a five-year contract with the Larned Telephone Company for connection with the subscribers of the latter company. The Ash Valley Company agrees that it will not maintain, install or operate any telephone within the corporate limits of Larned or connect with any telephone within the corporate limits except through the switchboard of the Larned Telephone Company, the Larned company to give toll connections at the same rate as is given its own subscribers.

FRANCHISES AND TRANSFERS.

WITTENBURG, Wis.—Mr. John Echoff of this city has made application for a telephone franchise.

GREEN FOREST, Ark.—The Farmers' Union Telephone Company has been granted a franchise in this city.

ROCKWELL, Iowa.—The Rockwell Farmers' Telephone Company has been granted a twenty-five-year franchise here.

HIGHLAND, Kas.—The Highland Telephone Exchange has ceased to be a mutual. The stockholders have sold it to L. B. Bender.

CAMERON, Wis.—The Cameron & Maple Grove Telephone Company has been granted a franchise to operate an exchange at this place.

NORTHFIELD, Minn.—The Northfield Telephone Company has been granted a franchise to construct a telephone line through Dundas.

SARATOGA, Ark.—Arthur Stoker has purchased the telephone line running from here to Columbus from the Nashville Telephone Company.

GREENFIELD, Ind.—The property of the Hannah-Jackson Telephone Company has been purchased by George Moore of Indianapolis for $1,600.

FINLAYSON, Miss.—The North Star Telephone Company has been granted a ten-year franchise to operate a telephone system at this place.

SEYMOUR, Ind.—The Citizens' Mutual Telephone Company has been granted a franchise to construct and operate a telephone system in this city.

SALESBURY, Mo.—C. H. Munsell of Excelsior Springs has recently purchased the telephone system in this city. Extensive improvements will be made.

BATH, Ky.—The Bath Home Telephone Company has purchased the Owingsville & Wyoming telephone line for $200 and will put it in first-class condition.

SENECA, S. D.—The Seneca Telephone Exchange Company has been granted a franchise for the construction and operation of a telephone system at this place.

NEVERSINK, N. Y.—The Neversink Telephone Company has purchased the Loch Sheldrake-Hurleyville Company's line, owned by S. R. Divine & Son of Loch Sheldrake.

DOWAGIAC, Mich.—The Cass County Home Telephone Company has secured franchises in Vandalia, Dowagiac, Marcellus and Decatur, and will soon have one in Cassopolis.

IROQUIS, Ill.—The Bundy telephone lines in Iroquis and Donover have been sold to E. P. Hoffman. The new company will be known as the Iroquis & Donover Telephone Company.

MOWEAQUA, Ill.—A. J. Combs has purchased the Haskell Telephone system at Haskell, Tex. The consideration was $38,000. The system consists of 300 miles of toll lines and seven exchanges.

SULLIVAN, Ill.—The Mutual Telephone Company has purchased the Sullivan Telephone Company for $13,000. There has been considerable trouble because of the two systems being in the one town.

CROWN POINT, Ind.—The Northwestern Indiana Independent Telephone Company has asked for a franchise in this city. If granted, the company agrees to lay its wires underground in the business district.

NORTH YAKIMA, Wash.—J. P. Reed, representing the Independent Telephone Company, has applied to the city council for a franchise. It is the intention of the company to make Yakima the headquarters for eastern Washington.

HORTON, Kas.—The Horton Mutual Telephone Company, recently organized, has been granted a franchise. The following officers have been elected: F. H. Wilson, president; W. H. Wheatley, vice-president; M. C. Weir, secretary; L. Reynolds, treasurer.

SUMNER, Iowa.—The entire property of the Sumner Telephone Company is now in the hands of E. A. Hurmence. The property includes nearly all the Independent lines in seven of the northeastern counties, and is valued at $160,000. Expensive improvements will be made over the entire system.

HUNTSVILLE, Tex.—The Central Texas Telephone Company of this city has purchased twenty local telephone exchanges and 700 miles of long distance telephone lines and merged them into one system. The local Independent exchanges taken over are in the towns of Teague, Huntsville, Madisonville, Navasota, Anderson, Iola, Zulch, Normange, Bedias, Spiro, Richard and nine others.

FORT WORTH, Tex.—The Southern Telephone & Electric Company, recently organized, will take over the telephone exchange at Weatherford and seek franchises at Mineral Wells and Granbury, following which it will endeavor to secure franchises in almost every town in north Texas except Dallas. The capital stock of the new company is $10,000. E. L. Swaine, president; J. N. O. Roach, secretary.

NEW CONSTRUCTION AND EXTENSION.

LANCASTER, Minn.—The Kittson Telephone Company will extend its lines to Bronson.

SALEM, Ind.—The Hoosier Telephone Company is constructing a new line to Martinsburg.

THAYER, Kas.—The Thayer Rural Telephone Company will construct a new line to Earlton.

CASSVILLE, Mo.—The Barry County Telephone Company will build a new telephone line to Crane.

MINNEAPOLIS, Kas.—The Farmers' Telephone Company will construct a new line from this place to Culver.

FORT WILLIAM, Ont.—The Fort William city council has decided to spend $36,000 for the extension of the municipal telephone system.

PHILADELPHIA, Pa.—The Keystone Telephone Company is stringing a line from Ambler to Doylestown, taking in Penllyn, Gwynedd, North Wales, Lansdale and other towns.

CHINA, Maine.—The China Telephone Company will extend its lines into the eastern part of Kennebec county, and will also build a line between Weeks Mills and South China.

WINONA, Minn.—The Winona Telephone Company, which has just completed a new line to Stockton Hill, has under consideration the construction of several other new lines.

ELLSWORTH, Kas.—The Ellsworth Telephone Company and the Lincoln Telephone Company will build a toll line direct from Ellsworth to Lincoln, each company building the line in its own county.

WESTMINSTER, B. C.—The city council has granted permission to the Burnaby & Coquitlam Telephone Company to install a system in this city and to extend their lines to Coquitlam and Burnaby.

NORTON, Kas.—The Farmers' & Merchants' Telephone Company will enlarge its exchange and add new equipment at a cost of $10,000. Ex-State Senator E. V. Peterson is president and E. E. Keckley of Almena is treasurer.

FLAGSTAFF, Ariz.—A line from Flagstaff to Camp Verde will be built this summer, and other extensions will be added later. W. E. Herring has charge of the construction. The line will be connected with the local telephone exchange at Flagstaff.

PENN YANN, N. Y.—At the recent annual election of officers of the Yates County Telephone Company officers were elected as follows: Walter B. Tower, president; Frank C. Spencer, secretary; David Miller, treasurer. Directors: Christie B. Briggs, H. L. Spooner, T. N. Davis, D. C. Ayres and others.

GREENFIELD, Ind.—The stockholders of the Farmers' Mutual Telephone Company of Hancock County have voted to make extensive improvements, among which will be a new switchboard at Warrington and a new building for the exchange. John A. Kuntz of Shirley has been elected general manager.

LOS ANGELES, Cal.—The Home Telephone Company will spend $5,000,000 in extending its telephone business in Texas. The Home Company has secured possession of some of the long distance lines between Dallas and Fort Worth and options have been secured upon telephone exchanges at Cleburne, Fort Worth, Waxahatchie and Ennis.

CEDAR FALLS, Iowa.—At a recent meeting of the Corn Belt Telephone Company some very important improvements were decided upon. A new metallic circuit will be built between Dike and Cedar Falls, and one between Dike and Grundy Center. A metallic circuit will also connect Cedar Falls with Reinbeck and Dike. A new 150-drop switchboard will be installed here.

MISCELLANEOUS.

ELLENDALE, N. D.—The Farmers' Telephone Company will establish an exchange in Ellendale.

ROLLING CENTER, Ind.—The La Porte Telephone Company will build an exchange at this place.

WESTFIELD, N. Y.—The Westfield Telephone Company has just perfected plans for the erection of a $10,000 exchange building.

PLYMOUTH, Ind.—The Plymouth Telephone Exchange will hereafter do all the construction work of the Patrons' Mutual Telephone Company.

NEWARK, Ill.—The Farmers' & Merchants' Telephone Company has been given permission to construct, operate and maintain its lines in this county.

SPALDING, Neb.—The Independent Telephone Company expects to build lines into the surrounding country and also to install an exchange in this city.

BAGGS, Wyo.—The residents and neighboring ranchmen of Baggs have organized an Independent telephone company. They will build a line from this place to Wamsutter.

OMAHA, Neb.—The Independent Telephone Company has received a permit authorizing the erection of a $50,000 brick and stone telephone exchange building at 1910-14 Harney street.

WINNIPEG, Man.—Francis Dagger announces that the Winnipeg government has begun construction of 1,500 miles of toll lines that are to connect with Independent toll lines of North Dakota and Minnesota.

ATHENS, Wis.—The Athens Telephone Company will expend about $5,000 in improving and extending its system. Lines are to be built east and west of Athens, extending to Halsey, Johnson, Hamburg and other places.

WARREN, N. H.—The Baker's River Telephone Company is constructing local and trunk lines from Plymouth to North Woodstock and Lincoln. An exchange is to be installed at North Woodstock and lines built from Warren to Woodsville.

CLEVELAND, Ohio.—The International Independent Telephone Association will transfer its headquarters from this city to Chicago. J. A. Harney has received appointment to succeed himself as assistant secretary of the association. G. W. Weippert will have charge of the publicity department.

WINAMAC, Ind.—The Winona Telephone Company, owned by Sam Tomlinson and A. B. Diggs of Winamac and W. S. Daniels of Knox, has closed a deal for the Plymouth telephone plant and connecting lines. The company has exchanges in Winamac, Knox, Kewanna, Hamlet and Grass Creek.

JACKSON, Miss.—The Home Telephone Company has just completed the details of its organization. The company is organized to construct, equip, maintain and operate a local and long distance telephone exchange and service in this city and other parts of the state. The capital stock is $350,000.

FREDERICKTOWN, N. B.—At the annual meeting of the stockholders of the New Brunswick Telephone Company the merger with the Central Telephone Company was completed. The following officers were elected: S. H. White, president; Senator Thompson, first vice-president; F. B. Black, second vice-president; Alfred Seeley, secretary and treasurer.

PETERSBURG, Ind.—The city council has notified the Cumberland Telephone & Telegraph Company that unless it pays into the city treasury $500 cash and 2 per cent annually on gross earnings on business within the city limits, the franchise will not be renewed and that the company will be compelled to cease doing business in the city.

ST. JOSEPH, Mo.—The Citizens' Telephone Company is considering plans for a new plant. The board of directors is composed of the following: Walter S. Dickey of Kansas City, W. F. Rankin of Tarkio, Gen. A. A. Goddard of Topeka and Theodore Gary of Macon. It proposes to install a new central energy system and construct a new permanent home for it.

SOUTH BEND, Ind.—Mr. Theodore Thorward writes that work is progressing in a satisfactory manner on the toll line his company is building to Cassopolis, where it will connect with the Grand Rapids circuit and A. C. Himebaugh's system. The line is expected to be finished within the next ninety days, and will afford direct toll line connections between Michigan and Indiana.

EL RENO, Okla.—At a mass meeting of the citizens of this city a resolution was adopted to form a new telephone company which will have for its purpose the building of an Independent system to connect with the Farmers' Telephone Company. The resolution also demands that the Pioneer Telegraph & Telephone Company shall remove its telephones from the business houses and residences.

NEW YORK, N. Y.—The board of estimate and appointment of this city, the franchise-granting power, has voted in favor of granting the Atlantic Telephone Company a franchise for Greater New York. The franchise will now be referred back to the full board to agree upon terms. The Atlantic Company is said to be controlled by the Automatic interests of Chicago, John M. Shaw, E. L. Barber, Martin W. Littleton and others.

CLEVELAND, Ohio.—At a postponed meeting of the Cuyahoga and United States Telephone Companies the stockholders of the Cuyahoga Company decided to call a special meeting July 22 to vote an increase in the common stock to the extent of $500,000. This will be done to enable the company to issue a further installment of treasury bonds, the statutes requiring that no corporation shall issue bonds in excess of its authorized capital stock. Several changes were made in the board of directors of both companies. C. Y. McVey and Norman C. McLoud of Cleveland and Clarence Brown of Toledo were elected to the board of the Cuyahoga Company to succeed F. S. Dickson of Cleveland and J. K. Secor and William P. Robinson of Toledo. The officers of the Cuyahoga Company were re-elected without change. W. L. Cary, Jr., and M. C. Harvey of Cleveland and H. R. Ashbrook of Toledo were elected to the board of the United States Company, succeeding H. R. Newcomb, Harvey Morris and C. A. Otis. Mr. Cary was elected secretary of the United States Company, succeeding James B. Hoge, who was made an additional vice-president.

FOREIGN.

CONSTANTINOPLE, Turkey.—It is officially announced that electricity is no longer prohibited in Turkey and it is likely that concessions for the introduction of telephones will soon be applied for and granted in the case of the larger cities. There are no telephones as yet in the Ottoman empire, and applicants for franchises should address the public works department, Constantinople, Turkey.

Telephoning Across the Atlantic.

Up to the present time wireless telegraphy has not supplemented or even appreciably interfered with ocean telegraph cables. In fact, wireless telegraphy has even aided submarine cables by bringing messages to them from vessels at sea. Of course, it is possible that, with increased invention, knowledge and experience, wireless telegraphy may make such progress as ultimately to interfere with ocean wire telegraphy. These two are essentially future competitors. But there would be no competition between wireless telephony and wire telephony across the ocean, because there is no ocean wire telephony and no immediate prospect of its arrival. It is more likely at present that wireless telephony may be extended in range to reach across the Atlantic Ocean than that wire telephony may be similarly extended. In other words, there seems more prospect at present of transmitting the human voice by electricity over the surface of the Atlantic Ocean than over an electric insulated wire carried under the ocean. The fact of transatlantic telephony is far from being accomplished as yet in either of these ways.—From "The Progress of Wireless Telephony," by A. E. Kennelly, in the *American Monthly Review of Reviews.*

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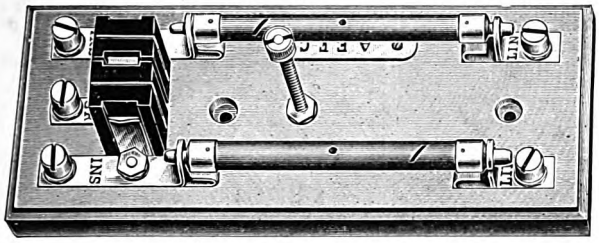

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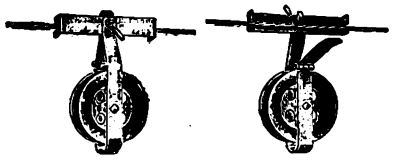

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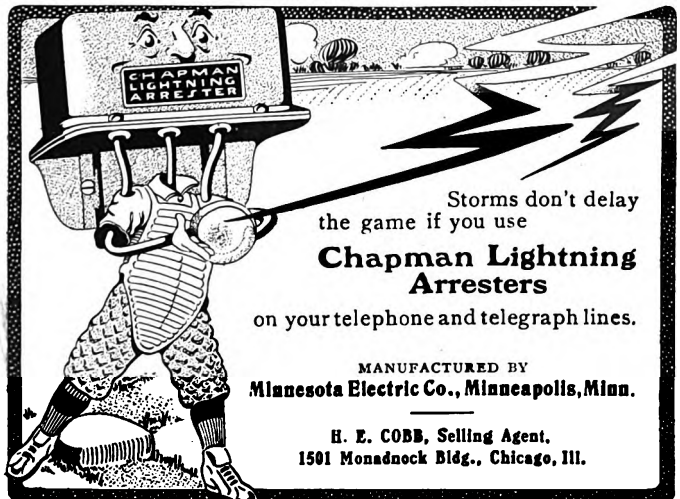

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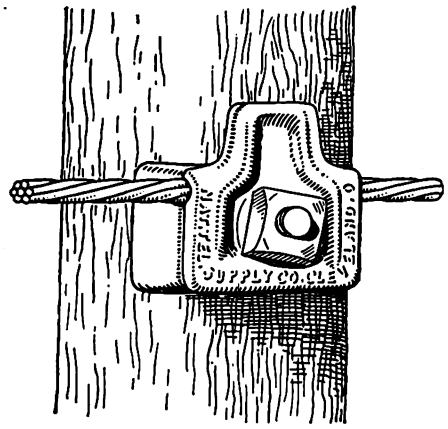

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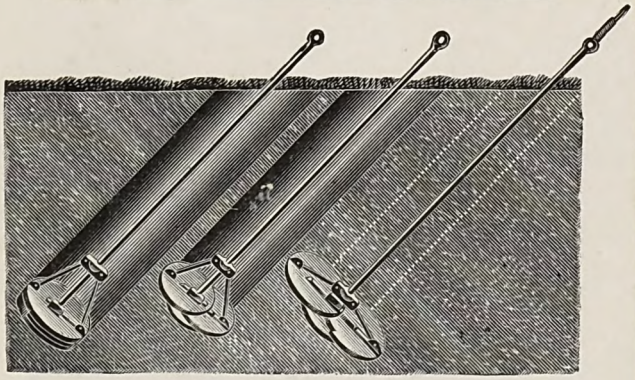

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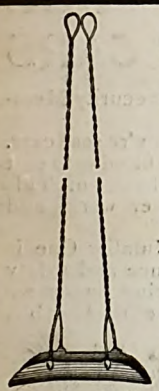

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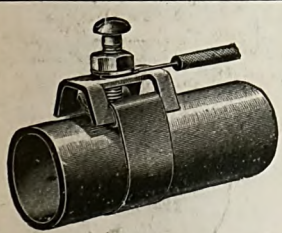
GET SAMPLES AND PRICES OF

BEFORE BUYING
RUBBER COVERED WIRE AND CABLES
Manufactured By
Indiana Rubber and Insulated Wire Company
Jonesboro, Indiana
QUALITY AND PRICE DECIDE.



NEW YORK GROUND CLAMP

For connecting telephone ground wires to pipes and cables. Cheaper than a wrapped connection; as good as a soldered connection. Adopted by nearly all the Bell Tel. Co.'s and most of the larger Independent Tel. Co.'s. Samples free on application. Write for list of other specialties.

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Yonkers, N. Y., U. S. A.
Western Electric Co., Agents

Anchors that hold

5, 6 and 7 Inch Stombaugh Guy Anchors have no Welds or holes for pins or rivets in the Rods. Stombaugh Guy Anchors BORE into the Ground.

NO DIGGING.

When in at a depth of five feet they are set. The Strain can be put on without fear of any "Back Give." Write for Catalog, etc.

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5, 6 and 7 inch Styles Holds 12,500. 15,000 and 17,500 Lbs. Respectively.

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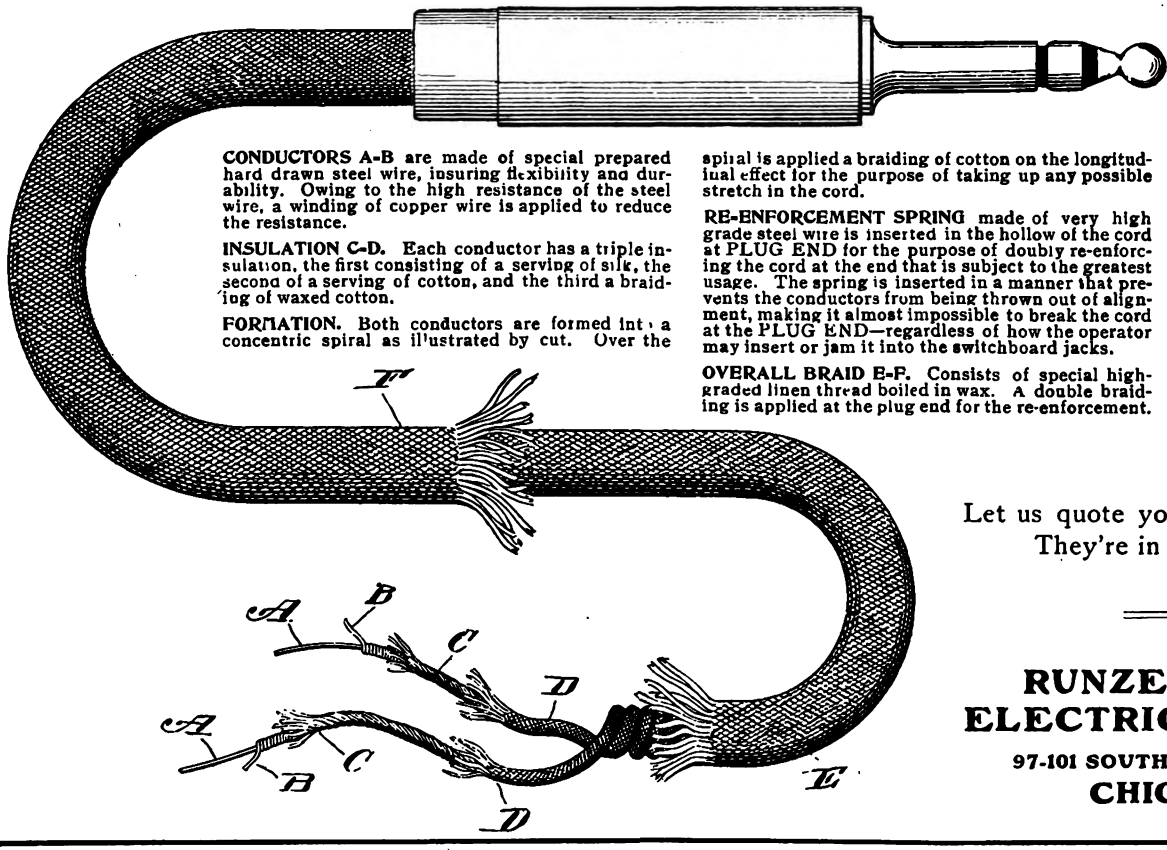
PREMIER BB STEEL CORD



CONDUCTORS A-B are made of special prepared hard drawn steel wire, insuring flexibility and durability. Owing to the high resistance of the steel wire, a winding of copper wire is applied to reduce the resistance.

INSULATION C-D. Each conductor has a triple insulation, the first consisting of a serving of silk, the second of a serving of cotton, and the third a braiding of waxed cotton.

FORMATION. Both conductors are formed into a concentric spiral as illustrated by cut. Over the spiral is applied a braiding of cotton on the longitudinal effect for the purpose of taking up any possible stretch in the cord.

RE-ENFORCEMENT SPRING made of very high grade steel wire is inserted in the hollow of the cord at PLUG END for the purpose of doubly re-enforcing the cord at the end that is subject to the greatest usage. The spring is inserted in a manner that prevents the conductors from being thrown out of alignment, making it almost impossible to break the cord at the PLUG END—regardless of how the operator may insert or jam it into the switchboard jacks.

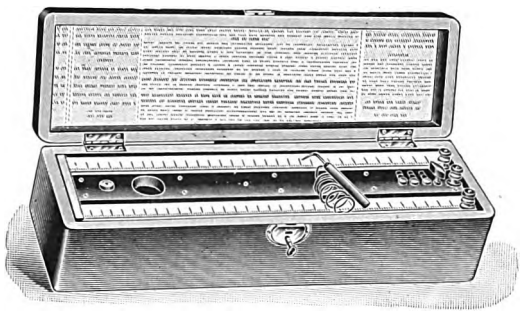
OVERALL BRAID E-F. Consists of special high-graded linen thread boiled in wax. A double braiding is applied at the plug end for the re-enforcement.

The Only Successful Steel Cord

Let us quote you our new prices. They're in your favor.

RUNZEL-LENZ ELECTRIC MFG. CO.
97-101 SOUTH CLINTON ST.
CHICAGO

Direct Reading Ohmmeters



TYPE F. Patented October 1, 1901, No. 683622

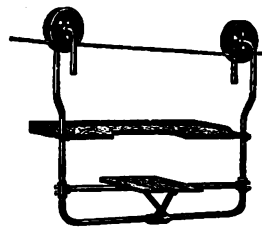
Made With Galvanometer or Receiver in 4 Different Styles.

An instrument which gives you your reading in resistance directly in ohms, eliminating the required expert knowledge to operate a bridge. For determining the resistance of coils, transmitters, receivers, drops, etc., and locating shorts and crosses on your lines, it is unequalled. We guarantee the accuracy of these instruments to one-tenth of an ohm. Will ship on 30 days' trial, returnable at our expense if unsatisfactory.

SEND FOR OUR CATALOGUE OF POLE-CHANGERS, DUPLEXERS, LEASE RECORDS AND COMPOSITE APPARATUS.

Sandwich Pole Changer Co.
700 Eddy Street **Sandwich, Illinois**

TWO MESSENGER CABLE CARS—BOTH SAFE CARS



And their name is Security Messenger Cable Cars.
Good name, eh? They're **good cars.** The Number One is fitted with seat and arm rest for the lineman. This helps him do better work, and more work.
The cost for the Number One is very low, convenience and safety considered, and during August we will make no charge for the table.

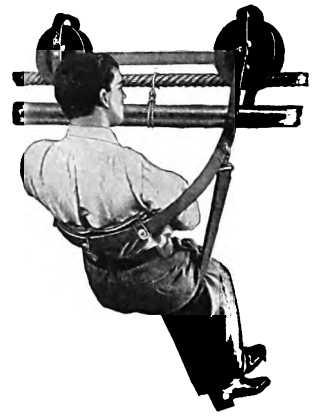
The Security Number Three

is a light 28 lb. car made to be placed in the quick repair wagon.

It's just as good as its big brother.

Get Bulletin Number Five.

It gives the prices etc.



TOLEDO, OHIO · THE F. BISSELL COMPANY · TRADE MARK

THE F. BISSELL COMPANY, TOLEDO, O.
235 HURON STREET

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SOUND WAVES

International Telephone Journal

VOL. XIV CHICAGO, AUGUST 15, 1907 No. 3

PUBLISHED MONTHLY BY THE

ELECTRICITY MAGAZINE CORPORATION

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S. RENTELL & Co., Representatives.

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Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisement can not be shown until the appearance of the edition containing it.

The publisher of SOUND WAVES *guarantees the advertiser a minimum circulation of 5,000 copies each month.*

CHICAGO, AUGUST 15, 1907.

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ENFORCED INTERCONNECTION.

DURING the past month, an attempt to introduce telephone competition in Connecticut has been frustrated by a legislature which failed to pass an equitable law; the telephone inquiry in Massachusetts has collapsed, because a special commission would not consider the evidence submitted to it as being material; several attempts to re-organize the U. S. I. property have been futile; a court in Ohio has decreed that a telephone company must pay to erect poles in front of a man's property unless it received the owner's written consent or paid for the privilege; the game of politics has cropped out in the matter of the Chicago Telephone Company's tentative franchise wherein Mayor Busse made the grandstand play for the flat rate; the New York Telephone Company has been attacked on the validity of its right to operate, and Judge W. H. Hunt of Montana has rendered his famous decision which appears in this issue of SOUND WAVES.

Pretty much doing for dog days!

We would draw special attention to Judge Hunt's conclusion which recognizes all telephone companies as public service corporations, not unlike railroads. This court has held that competing telephone lines must serve each other. It upsets present practice. Its literal fulfillment, if it was far-reaching enough to embrace the entire United States in a short space of time, would completely change the policy of the telephone business, viewed from any angle. The Bell Company fought the case on the grounds that its lines were built for the exclusive use of its patrons. Where the Bell is strongest, these would be natural deductions. It is strong in Montana. What it doesn't want in that state it is seeking in other states. The Bell would be glad to have a Judge Hunt in Indiana or Ohio and in other states where it is weak.

A paper assuming to represent Independent telephone interests, and enjoying scant patronage from Independent manufacturers, commenting on this matter said: "Under Judge Hunt's decision the Independents can use the Bell long distance service until the Independent long distance lines are built." How ridiculously silly! Under Judge Hunt's decision, even if it directly concerns only interstate business, the principle it sets up would certainly be established sooner or later in the several states.

As the matter lies, the effect of this opinion must strike both ways. The Independents do not want such a condition. The Bell Company isn't wanting it.

But from the point of view of the general public the telephone companies, like the railroad companies, are common carriers, enjoying the privileges and subject to the obligations of a common carrier, and therefore bound like the railroad to connect with competing lines and to carry business originating on competing lines or to send over a competing route to a common point business originating on its own lines, if any one desires such a routing.

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On the surface, at least, this analogy appears sound, and unless it can be shown that the telephone business is so essentially different from that of the railroad business as to vitiate the analogy, the public will regard Judge Hunt's decision as equitable.

As it does not bear directly upon the immediate condition, it behooves Independents to rally to the long distance lines, thus strengthening their present weakness to combat a monopoly especially well fortified in this phase of the business.

SUPERINTENDENT AND HIS MEN.

IT seems necessary to the success of human endeavor that there shall be leaders. Some one must take the responsibility of saying what shall be done first; plan the way to do it; select the workers for each place; and see to it that all energies are bent in the right direction for the best results. It takes more than an ordinary man to do this, even in some of the smaller affairs of life. In the greater deeds that have been done, few appreciate the greatness of the men who have piloted affairs through and brought success. Both the worker and the leader should come in for a just share of praise for success, and the blame for failure should be placed where it belongs. Without obedient workers who faithfully do the part of the work assigned to them, the greatest leader in the work is powerless.

There is a tendency on the part of workers to think themselves slighted and underrated, but it is not necessarily true that they are undervalued in all cases. Much misunderstanding may be avoided by proper relations between those who direct and those who execute. There was once a tendency to regard the workers as machines; to get all possible work out of them, and to cast them aside when no longer useful. Some will say that this is the case yet, but we do not believe that it is generally so, or that the custom prevails in the majority of cases. In times past, the conservation of men was not recognized any more than the law of the conservation of energy. Under these conditions, it is not surprising that men became disgruntled and felt abused—for they were abused.

A step in the right direction is in taking the workman somewhat into the plans of his superiors. When treated as an unthinking, unreasoning machine, the man who works cannot be blamed for acting as such. Many exasperating incidents have occurred from this cause, but if shown somewhat of the ultimate object of a certain procedure, the laborer is more likely to take an interest in it and turn all his energies to help make a success of it. Sometimes a workman will see a point in telephone construction which has escaped the attention of the superintendent, the observance of which may result in a valuable improvement. Any man in almost any position will be happier if given a proper amount of latitude. System is necessary for the highest development of any business, but this ought not to be carried to the point of taking away spontaneity.

There are daily coming to be fewer places where blind obedience is expected. This is especially true of men sent to work at some distance from the source of authority and out of communication with it. It is then that reliance must be put on the judgment of the man to do what he was told to do in the best possible way. Some superintendents still like the idea of laying out the work in a certain, definite way and hold the men to an exact execution, but as no one man can see all things, he may make a mistake. He may not take into account some factor which would make a little variation of the plan advisable. Or there may have occurred some change in the lay of the land since the superintendent saw it last. There is a great deal that might be said along the line of proper training of men for this class of work, but most people are glad to find that their men are able to take care of the unexpected, and adapt the work to bring the best out of what would have been a mistake if persisted in along the original plan.

A superintendent once sent two men to change the location of a pole. He ordered them to move it east. That was the sum of his instructions. When the men got to the spot, they saw that moving the pole east would leave a great disparity between the lengths of the two spans, while to move it west would leave the two spans more nearly equal in length. They thought that this point had escaped the superintendent's attention and that he would be glad if they corrected it. So they moved the pole west. When they made their report they found that it had been the intention later on to insert an extra pole at that point, in which case the move to the east would have been a correct one as directed. Now the question comes up, should the superintendent have held the men to strict, literal obedience in this and all other cases, even if it led into what seemed an obvious mistake, or should he have told them, when he sent them out, the reason for the order which seemed to be a mistake? If we hold men to literal execution in all cases, we must not expect them to use their brains to help us out when we make a mistake in an order. It takes only a moment to explain the object of a movement, and it gives the man a feeling that he is not working in the dark.

There is something to be said to the workman about caution in varying from a plan laid out by a superior. It is not safe to do it as a rule. Usually the man at the head of affairs knows what he wants done and the best way to do it. The workman may have his own ideas which he thinks are better than those of the man above, but that does not prove that they are. The chances are against it. But if each man has the proper regard for the other, they will get along better and the work of the company will prosper as far as they are able to make it.

A TESTIMONIAL.

AN editorial in a recent issue of the Hamilton (Ohio) *Sun* should find a generous reprinting in the literature advocating Independent telephone interests. Besides having the whole hearted spirit of sincerity, none of the argument pro and con has been omitted. Here is the *multum in parvo* among newspaper clippings:

At a recent meeting of Independent telephone men in Columbus, W. G. Thompson, manager of the Hamilton Home Telephone Company, delivered an address in which he contended for competition in the telephone business, taking the stand that it brought about better service and better conditions for all concerned. Mr. Thompson is right.

From the point of view of the average person—that is, the average telephone user—there can be but one verdict in relation to telephone competition. Hamilton exemplifies this to a marked and distinct degree. There was a time, not so many years ago, when Hamilton was absolutely in the clutches of the Bell telephone monopoly. The service was miserable and the rates were high. Hamilton rebelled and enterprising local citizens organized an Independent telephone company. This company has prospered until today it has, as we all know, a vastly larger number of subscribers than has the Bell Telephone Company. Many will argue that this has worked a hardship upon the people; that they have had to have two telephones instead of one; but if they will stop to think, they can readily see and understand that while they have two telephones instead of one, they have three or four times the number of subscribers that they may reach with the two telephones at less cost than the one original telephone. In other words, they are getting four times the service, at least, for the same price that a miserable and inadequate service cost them in the years not far past.

All theorists will contend that the telephone should be a natural monopoly; that by its very nature it should be monopolistic. They will argue that two telephone systems are super-

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fluous, annoying, and in various ways unnecessary. Theoretically, this is true. Practically, and in the light of experience, it is false. If there were one telephone company which furnished a complete and perfect service at a minimum charge—if that telephone company would give the people all that they are entitled to and reserve for itself only such profit as would be reasonable, the theoretical point of view would square with the practical.

But it happens that none of the telephone companies are philanthropical and it follows that where there is competition the service is constantly extended, the facilities are constantly increased and the benefits derived by the public are proportionately enhanced.

Hamilton has had her experience in this line and can speak with authority. Competition in the telephone business is as necessary as it is in any other line. This is particularly true when it is necessary to bring about a curtailment of the privileges and advantages enjoyed by an arrogant monopoly.

TRYING OUT NEW IDEAS.

PERSISTENCE is worth as much in telephone work as anywhere else. If the inventor of the telephone had given up when he struck his first difficulties, we might not now be enjoying its benefits. Every new idea, however good it may be, has its drawbacks, and if the thing is to do the world any good, some one must give his time to the elimination of the faults. Some one sees the disadvantages of some old device, or method, and becoming disgusted with its bother, sets their wits to work to invent a better one. After thinking over many plans, the one which is thought to be best is adopted and a start is made to develop it. When the work has been developed as far as possible it is put into practical use.

Now it is a characteristic of all inventions that they work far better in the hands of the inventor than they do in the hands of the unfeeling stranger. Perhaps it is like the old proverb of other people's children making more disagreeable racket than our own. The general user is the one who discovers the latent faults, throws the new device away and returns to the old.

Applied to the telephone business, this is the place where the general public, particularly the operating companies who try out the new devices, can render the most valuable aid to the advancement of the art. New things often have defects of manufacture, while the fundamental idea is all right and sound. Instead of throwing the whole thing aside as a bothersome nuisance, it would be well to take a little time to see where the trouble lies. Perhaps a certain bolt needs to be a little stronger, or a certain hole shaped a little differently. Perhaps this condenser needs to be four micro-farads instead of two, or that wire changed from one place to another. If the idea underlying the device is good, it is worth while to polish up the practical details. No one can do this in some respects as well as the user. At least, he can tell what the difficulty is in its effect. By lending your time and genius to the betterment of devices, circuits, and methods in general, you will be the gainer as well as others.

SIGNS.

WHEN the Independents adopted the shield as an emblem, they chose a design somewhat expensive to reproduce. To be most effective, the three colors, red, white and blue, should always characterize it. "Independent" on the blue field does not detract from the beauty of the emblem, but it is hardly strong enough to lend emphasis to that important word. "Local and Long Distance" as it appears across the bars, lose nearly all of its strength, when the shield is reduced to small proportions. Viewed from an artistic standpoint the designer has a pretty creation in sentiment and color, but as a commercial proposition the emblem as an entirety might be improved. But we do not wish to refer to the matter in a disparaging way. We would only offer a suggestion that will enhance the shield's possibilities as an advertisement. The die maker and the engraver and the artisan is equipped to make stock shields from celluloid to cast iron and in all sizes. These things represent a tremendous outlay for the manufacturer. He should be rewarded with a large sale for his product for there is a crying need for more display of the shield. Hundreds of communities do not know what it stands for as applied to the telephone business.

It was only a little while ago when W. J. Stadelman suggested the subordination of the shield to the more significant term "Long Distance." Mr. Stadelman claims that the dear American public associates the words "long distance" as belonging exclusively to the Bell Company. We quite agree with Mr. Stadelman. Out west where he lives, the Bell Company has for years made a practice of indicating long distance sets in its telephone directories thus: ♙ For instance, the "full metallic" subscriber was

♙ Jones, Wm., 400 Easy Street,

and his neighbor, who would not stand the "squeeze" for such luxury was plain

Smith, Simeon, 23 Skidoo Street.

And thus the emblem of the Bell Company has become synonimous of long distance service. The practice should be emulated by Independents. We can see good reasons for encircling the shield with the words "long distance" in bold relief. The duplication of these words on the shield itself is immaterial. It would lend emphasis to the long distance feature and that is the thing to be desired.

In the matter of signs, Independents are to be congratulated on the quality of the product they have to select from. Sign making had reached a high development before the advent of the Independent industry. Improvement has kept steady pace with the times. The shield in all its patriotic splendor may be had in any quantity and any size at commensurate prices. A handsome design is offered for use where electric lighting current is accessible. These are either spherical or canteen in shape, suitable to be attached as a shade for incandescent lamps. The emblem appears in brilliant color on a background of ground glass and when the lamp lights, the effect is very striking. Increased use of signs and other advertising is essential to the best welfare of Independent progress.

BELL SPECIFICATION No. 23.

SOUND WAVES has endeavored to point out from time to time the total lack of consistency in the prevailing method governing the Bell's Boston Press Bureau. The public has long since learned that a general order issuing from Boston in any other department is followed literally by all of the subsidiary companies throughout the United States, but the press bureau is a free lance. Nothing governs it—there is no guiding spirit. What it says seriously in Boston may be considered as a joke elsewhere. Here is corroborating evidence:

Figures show that the minor "troubles" of the telephone service and the measures taken to keep the plant in perfect working condition, day in and day out, cost the companies millions of dollars every year. This does not count the havoc wrought among the wires by storms and floods—the calamities of the business, as they may be called—but includes only the diurnal round of things gone wrong, which are sometimes simple enough when they are found, but are often very difficult to locate and always even more disconcerting and annoying, and much more expensive, to the telephone men than to their subscribers. * *

* Considerable malicious damage is done by thieves, who strip cables, leaving the wires exposed to rain and sleet, for the sake of the lead of which the covering is made. Squirrels are

almost as bad as two-legged thieves, gnawing the protecting metal away and sometimes tampering with the insulation of the wires within.—*Excerpt from a Boston "Dope" Sheet.*

The complaint hasn't been very general regarding the lead-eating squirrel and the damage it is doing, but there seems to be some trouble of this kind out at Salina, Kansas. It is just possible that the squirrels have a grievance against the Bell in the sunflower state! At any rate it is alleged that the local manager of the Salina plant wrote to the general offices of the M. & K. T. Co. at Kansas City, asking what to do in the matter, and this is what he drew:

No. 23—Specifications for Preventing Rodents from Destroying Lead Cable.

"General.—This specification is intended to set forth a method of preventing squirrels from gnawing the lead sheet from aerial cables, and while some of the suggestions may seem to be of a frivolous nature they are presented in good faith and with the expectation that they will be closely followed.

"Method.—It has been suggested that the foreman in charge of the infected district place a man upon each pole and instruct him to make a noise like a nut, thus enabling him to coax the squirrel near enough to be caught and killed. But owing to the scarcity of men since the strike, and the fact that several men have already gone 'nutty' over this scheme, it is not deemed practicable.

"The best method obtainable at the present time is to hang below each cable hanger a nut of some variety, placing them in the order named: Upon the first hanger place a peanut; second, a hazelnut; third, a walnut; fourth, a hickory nut; fifth, a butternut, and, sixth, a beech nut.

"It is suggested that about every ten feet two nuts be placed under a hanger. This will cause the squirrel to think that he has suddenly become cross-eyed and the scare will cause him to lose his foothold and the fall will kill him.

"If he has not been killed by the fall, but is crippled so that he may be caught, grasp him firmly by the back of the neck and tickle his ribs until his mouth opens wide with laughter, then fill him full of lead shot, which will cause him to sink, and throw him in a vat of sulphuric acid. This will eat away all the animal matter and the remaining lead from his system may be sold for junk."

THE FARMER PROBLEM.

FROM all over the country comes the encouraging report that farmers' mutual lines are clamoring for direct connections with the local exchange in town or village. The plan of depending upon switches over other farm lines, while commendable from an economical standpoint, is far from satisfactory. The farmers' service, usually bad enough at its best, is never made better by going over another line of like kind, especially when the attending lack of switching care is imposed. The farmer is demanding better service and he has partially learned that good service will cost him a trifle more per annum and he is glad to pay the small increased cost. In a majority of cases this will mean better rural construction henceforth, and a reconstruction of lines already built.

During that period of the greatest development in farmer lines, a telephone was a "machine that would talk" when attached to a circuit. No particular attention was paid to the quality of the instrument, so long as it would indifferently perform its function. It was known that wire was essential to form circuits and ordinary fence wire answered the temporary purpose. It was therefore adopted. It cost less than standard telephone wire, so why indulge in superfluous extravagance.

When the farmer built his original line, he followed the precepts of the pioneer. He shifted for himself, following his native instinct for specifications. The skirts of nearby timber land contributed the saplings for poles; the bracket and pony insulator was all else that he needed. How perfectly marvelous that such construction has endured for a decade and that the service it afforded has been tolerated!

The rural line problem has been the bugbear of the exchange manager's career and he is indeed happy that the farmer is beginning to realize that the telephone business is an industry of itself.

TELEPHONE POLE DEPRECIATION.

THE United States Department of Agriculture contributes some interesting speculations regarding the future supply and demand for telegraph and telephone poles. It is estimated that at the present time there are about 800,000 miles of pole line in the United States, and owing to the extension of trolley and telegraph lines, this mileage is rapidly increasing. "Assuming," says the Year Book of the department of agriculture, "that the 800,000 miles of pole line are constructed on a basis of forty poles per mile, and that each pole contains an average of twenty cubic feet, it will be seen that there are now in use 32,000,000 poles, representing 640,000,000 cubic feet of timber. If the average length of life of these poles is twelve years, there are annually needed for the maintenance of the present lines alone, over 2,650,000 poles, containing approximately 52,000,000 cubic feet of timber; and if it requires sixty years to grow a pole, to maintain the supply there should be five poles growing for every one in use, or 160,000,000 poles for renewal merely, besides what the extension of business will call for."

TELEPHONE IN LIVERPOOL.

Telephones are not as generally used in Liverpool as in America, writes Consul J. L. Griffiths, the total number of telephones in that city and suburbs in a population of 1,020,000 being only 24,415 on December 31, 1906. The English service is perhaps not as good as the American. The absence of competition, there being but one system in that district, and the disinclination to adopt the latest improvements impairs the efficiency of the service, while the requirement that the rental shall be paid an entire year in advance decreases the number of subscribers. The long-distance service is not comparable to such service in America. By a contract executed some time ago the telephone system will be nationalized and pass into government ownership in 1912. It is said that when present contracts expire a measurement basis will be inaugurated similar to the American system and the rate established on a minimum number of calls. The new method has awakened decided protests from the public.

THE EXTENSION SET.

Extension set service is a leader. It is thought by many to be the first step toward luxury in telephone service, but in reality the installation of an auxiliary instrument is the surest means of impressing upon a subscriber the essential characteristics of telephone service which give it value. It reduces the loss of time and energy in communication to its lowest terms, and so drives home the impression of the absolute necessity of telephone service in the strongest possible manner.

Where a measured rate system of charging is enforced by the telephone company the extension set not only stimulates subscribers to a more extended use of the service, but becomes in every sense a revenue provider for the telephone company, as each additional instrument in a house or business establishment is bound to have a tendency to increase the rate of calling.—*American Telephone Journal.*

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An Interference Method for Determining Frequency of Harmonic Ringers

By Arthur French Poole

THE harmonic pole changer as a source of alternating current of the four frequencies used in harmonic ringing systems has come into wide use during the last year. It consists of four reeds tuned to vibrate 1,000, 2,000, 3,000 and 4,000 times a minute. These reeds are kept in vibration by a make and break contact arrangement similar to that of an ordinary vibrating bell, and carry contacts which reverse a battery current through the primaries of suitable transformers. The secondaries of these will then supply alternating current of the frequencies of the reeds.

Of course, the frequency of the current delivered by the pole changers depends entirely upon the rate of vibration of the reeds. These rates, in turn, depend to a greater or less extent on a number of variable factors, such as the temperature, the amplitude, the tension of the several contact springs and the fatigue of the reeds. While these factors are, as a rule, small, yet since the operation of the harmonic system is very sensitive to changes in the frequency of the ringing current, they must be allowed to obtain the best operation. In general, the allowable variation of frequency should not be over one and a half per cent and the more it is kept below that the better.

In the muticycle sets, it is very easy to determine the frequency, since it is but a matter of observing a revolution counter; but with a pole changer, it is a different matter. About the only way open to the exchange man is to put a harmonic bell of the same frequency into circuit, monkey with the springs of the pole changer until the bell rings best and then trust to Providence that the bell is standard. Since one is working altogether in the dark, this is at times a most heartrending job, and one fails to see the harmony in the system.

One method used in several factories is to fasten a light quill to the reed and have it make a sinuous mark on a piece of smoked glass or paper, which is moved at right angles to the plane of vibration of the reed. A second marker, electrically connected to a clock, makes a mark one a second on the paper. Then by counting the undulations between the clock marks, the rate of the reed may be determined. This method is a laboratory one and is plainly unpracticable for the exchange man. Then again it is tedious and really does not give what one is after—the rate of vibration under working conditions.

The interference method which I shall now describe is in the reach of every exchange, since necessary apparatus can be improvised from material at hand. It depends for its operation on the fact that if one puts two sources of alternating current of approximately the same voltage and unequal frequencies in series on the same circuit with a telephone receiver, the hum which the alternating current will make in the receiver will vary in intensity. When the two currents are in the same phase, the effective current will be the sum of the two currents, as one current gains on the other, the sound in the receiver grows less until when the two currents are in opposite phase, the sound is least. At this instant the effective current is the difference between the two currents. Thus it will be seen that each "beat" corresponds to one of the currents, gaining a complete cycle on the other. If the beats are slow enough to count and one frequency is known, the other may be determined by adding or subtracting the beats per minute to the known frequency.

To illustrate, suppose source A is known to be 1,000 cycles per minute and the rate of source B, known to be greater than A, is desired. On connecting the sources as above, 25 beats per minute are heard in the receiver. The frequency of B is 1,000 and 25 or 1,025 cycles per minute.

It will be seen that to use this method, a current of known frequency near the frequency of that of the reed will be required. When an office has already a multicycle set in addition to the pole changer, the standard currents can be had from it. For an office not so equipped, the standard currents may be transmitted over a toll line from an office having a multicycle set. I shall first describe the method of tuning the reeds of the pole changer when there is a multicycle set in or near the office.

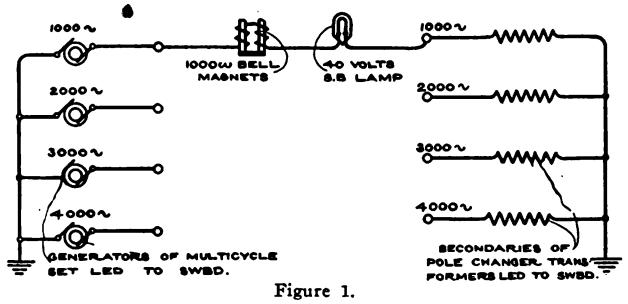

Figure 1.

In Figure 1 is shown the four generators of the multicycle set and the secondaries of the pole changer terminals led to the bus bars of the switchboard.

In this case a 40-volt switchboard lamp in series with about 1,000 ohms inductive resistance can be advantageously substituted for the receiver. If the frequency of, say, the 1,000 cycle pole changer current is slightly different from that of the 1,000 cycle current from the multicycle set, interference of these two currents will cause the lamp to flash, just as beats were caused in the receiver. When the two currents are in the same phase, the lamp will be lighted; as one gains on the other, thus changing the phase relation, the light will grow dim and when the two currents are in opposite phase, the light will go out. As the currents come into the same phase, the lamp will again grow bright. Each flash of the lamp will therefore correspond to a difference of one cycle, by counting the flashes for a minute, the rate of pole changer current and therefore the vibration of the reed may be determined with exactness.

For instance, if the lamp flashes 25 times during a minute, the pole changer current is 25 cycles a minute different from the standard. If the standard is 1,000, the pole changer current is either 975 or 1,025 cycles a minute. How to determine which will be told later.

To tune the reed, first determine the speed of the multicycle set. This is done, of course, with a speed indicator. To avoid accidental errors, it is worth while

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to make a couple of runs of 5 minutes each, take the total number of revolutions in each case, divide by 5 and then take the mean of these results. This will give the average speed of the muticycle set. Now, connect the lamp as shown, supposing that the test is on the 1,000 frequency reeds, and count the flashes of the lamp during a minute. This will give you the difference between the two frequencies, and one is now ready to adjust the reed.

This adjustment can be made in several ways. At present one maker of pole changers is providing the reeds with adjustable weights. Raising the weight makes the reed vibrate faster and lowering it has the contrary effect.

Another maker provided no adjustment, being apparently under the idea that the rate of vibration of the reed will never change. In this case the only thing to do if changing the tension of the contact springs will not alter the rate sufficiently, is to add or take off weight. The addition of a small washer to the weight will slow the reed very perceptibly. Or one can take off the weight, plug up the screw hole in it and bore a new one off of center, thus making the weight eccentric. Turning the weight about its new axis will change its effective position and therefore the rate of the reed.

After having observed that the lamp flashes, say, 25 times a minute, shift the weight a small amount so

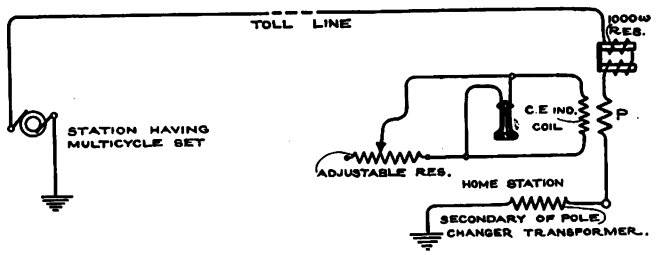

Figure 2.

as to increase the rate of vibration of the reed. If the number of flashes is more than 25, it shows that the shifting is being done in the right direction. By shifting the weight a little at a time, the lamp can be made to flash but once or twice a minute, thus showing that the two frequencies differ but by one or two cycles per minute from that of the standard. Suppose the 1,000 reed were under test and the lamp flashed twice a minute, this would show, if the standard were 1,000, that the rate of the reed was but 2 parts in a thousand different from that of the standard, or a variation of but 2-10 of 1 per cent. If the same number of flashes were obtained with the 4,000 reed, it would show an accuracy of 1-20 of 1 per cent. If the rate of the standard is not exactly 1,000, such difference must, of course, be allowed for. For instance, if the standard is 1,002, the reed will be 1,000, and consequently slower than standard when the lamp flashes twice a minute.

For the case where the multicycle current has to be transmitted over a telephone line, the lamp cannot always be used and recourse must be had to a receiver. The circuit would be arranged as in Figure 2.

At the far station is shown the generator of the multicycle set having approximately the same frequency as the reed under test. At the home station is shown a 1,000 ohm resistance, which may be a bell as before, an ordinary central energy induction coil, and the secondary of the transformer of the pole changer. A receiver shunted by an adjustable resistance to bring the sound to a convenient intensity is in the other winding of the coil. The method of tuning is the same as in the previous case, the beats in the receiver giving the same information as the flashes of the lamp.

It will be seen that this method is one of great precision, in fact, the only limit to its accuracy is the accuracy of the standard source of current. If the frequency of the multicycle set is steady enough, it is easy to tune the 1,000 cycle reed so it makes but one flash per minute. This is one part in 1,000, or 1-10 of 1 per cent.

It is very interesting to watch the change in the rate of the reed, as shown by the change of the lamps' flashing, caused by a slight change in the tension of one of the springs. It is this feature which makes the method so convenient. Instead of making a change and having to count the marks on some smoked paper to see what effect the change has caused, one can see the effect as soon as the change is made. If one has the idea that the rate of vibration of a pole changer reed is not dependent on the tension of the contact springs, a little experimenting with this method will speedily and effectually remove it. On a pole changer under observation, the rate of the 1,000 reed could be changed 30 vibrations per minute by a change in the tension of the driving contact spring. This was a variation of 3 per cent, almost enough to stop the response of the 1,000 cycle bells. The higher frequencies could be changed even more from the same cause.

Another thing which was noticed was that the reeds get fatigued as they are kept vibrating and lose to some extent their elasticity. A pole changer under observation, which had been going some three months, had all frequencies from 1 to 3 per cent slow. It had been presumably adjusted correctly when it left the factory, and the adjustment had not been disturbed, so that the only explanation of the change seems to be fatigue of the reeds. In order to bring the reeds up to speed, the weights had to be shifted as high as possible.

This is not a serious fault if known and watched for, but it suggests checking up the frequency of the pole changer reeds from time to time. When it is considered that the success or failure of the operation of the harmonic system is largely a matter of keeping the frequencies of the ringing currents within 1½ per cent of standard, the importance of having some way to check the frequency of the pole changer currents will be recognized.

Technical Journals.

That the advantages of technical journals to college students are not fully understood, is evidenced by the fact that professors do not encourage careful study of such magazines. The distinct advantage which we wish to bring out is not that it keeps the student informed of the latest progress of work in the various fields, for that is a well-known fact, but that it affords him an opportunity to become acquainted with all fields of engineering, to understand what each field offers and thus to insure for him in the selection of his life work the field in which he will be most efficient.

When the man enters the technical college it is in nine cases out of ten with the intention of studying one of the three great branches of engineering, civil, mechanical or electrical. He does not realize that each one of these branches includes a great number of particular fields, in fact, he does not fully comprehend this until his university days have practically reached an end.

These words refer to the average student and the facts, which they disclose, could be testified to by many a man who has changed his field of study after a few years of practical experience. Experience is the best teacher of all, but still it should be preceded in the best possible way to escape from all unnecessary waste of time and to obtain from such experience the foundation for future development.—*Engineering World.*

Judge Hunt's Decision

THE recent decision of Judge William H. Hunt of Helena, Montana, in the case of the Billings Mutual Telephone Company against the Rocky Mountain Bell Telephone Company has attracted national attention among all telephone operators of the country, who regard the decision as of far-reaching importance. It is the first one of its kind ever rendered and is regarded as a pioneer in the field. For one thing, it established a precedent where in the past there was none.

In his decision Judge Hunt held that the application of the plaintiff to compel the Bell Company to allow the Mutual to connect its toll lines with those of the defendant is a public use and that the plaintiff is entitled to invoke the right of eminent domain to do this. Commissioners will be appointed to determine the amount to be paid by the plaintiff to the defendant as damages by reason of the appropriation to the defendant as damages by reason of the appropriation and use by the plaintiff of the defendant's telephone lines at Billings.

It is not known whether the decision is of general application. In the decision, Judge Hunt construes the constitution of the state of Montana and supplemental ligislation regarding eminent domain.

In granting the motion of the Mutual Company for findings and the order appointing commissioners the gist of the findings were as follows:

That the proposed connection as asked for in the complaint of telephone lines is a public use within the meaning of the laws of Montana.

That the connection is necessary to public use.

That the public interests require the use of the defendant's telephone lines by the plaintiff and the connection of the lines for interchange of business as set forth in the complaint.

In the litigation, O. F. Goddard of Billings appeared for the Mutual, and H. G. and S. H. McIntyre of Helena for the Bell.

The title of the suit was that of the Billings Mutual Telephone Company against the Rocky Mountain Bell Telephone Company. In his opinion, Judge Hunt says:

The plaintiff is a telephone company operating some 350 telephones in use in its exchange in Billings, Mont. The defendant owns and operates a long distance telephone line and local exchanges in many cities within Montana. The defendant conducts a general long distance telephone business and maintains a local exchange business in the city of Billings. Plaintiff has endeavored to make some agreement with the defendant company by which it could connect its telephone line with the line of the defendant, so as to acquire the use of the long distance line of the defendant for transmitting messages for the convenience of the business of the plaintiff and its numerous customers, and for the convenience of the public generally in the city of Billings and throughout the state of Montana.

But the defendant has refused to grant plaintiff the privileges of a connection and use of its line in any manner so as to allow plaintiff a right to connect its telephone system with the long distance line of the defendant. The complaint asks the court to decree to plaintiff a right to connect its telephone line with the long distance telephone line of the defendant at Billings, upon such terms and for such compensation as the court may deem just; and plaintiff prays that the court may proceed by law to determine the right to connect, and the value of the service and use of defendant's line.

The defendant answered by admitting that the connection with and use of the defendant's line by the plaintiff would increase the revenue of the plaintiff and accommodate its customers, but it denies that the use of defendant's lines by plaintiff are necessary for the proper operation of the telephone line of the plaintiff, and alleges that such connection is desired by plaintiff to save it the great expense of building its telephone lines through the territory covered by the telephone lines of the defendant. It denies that connection of the lines of the plaintiff with those of the defendant would be a great convenience to the public generally in Billings and alleges that the public generally would not be afforded any greater facilities in the use of telephones, in event of the connection desired by plaintiff being made than the public now have.

Defendant alleges that the plaintiff and the defendant have competing lines in and about Billings, but that the defendant's lines reach through a large territory not reached by the lines of the plaintiff and that the plaintiff seeks to have the use of defendant's lines, solely for the pecuniary benefit and business conveniences of plaintiff. Defendant further avers that such connection and use by the plaintiff of defendant's lines are not authorized by law. It alleges that the taking sought is not necessary, and that its lines are already appropriated to the public use and that they cannot be taken or appropriated except for a more necessary public use, and that the connection and use sought are not authorized by the laws of the state of Montana.

For further answer, the defendant alleges that its telephone lines and system run into several states, so that telephone connection can be had by persons within the said several states and that use of its lines at any time and in any manner that the plaintiff might see fit to make use of them, without the intervention of the employes or other instrumentalities of the defendant would greatly interefere with defendant's lines and business, and would result in great loss to it; and that defendant would be obliged to construct additional lines at great cost, and that foreign electrical currents would injure and destroy the property and business of defendant; and that such use and connection as plaintiff desires is against the laws of the state of Montana and contrary to the provisions of the fourteenth amendment of the constitution of the United States.

The plaintiff moved the court, under the pleadings for findings under the provisions of title seven, of the code of civil procedure of the state of Montana entitled "Eminent Domain," and also asked the court to appoint three competent persons as commissioners to ascertain and determine the amount to be paid by the plaintiff to the defendant as damages, by reason of the oppropriation and use by the plaintiff of the defendant's telephone lines at Billings, Mont. Before the motion was submitted the court requested the respective parties to produce testimony as to how, if at all, a connection could be had between the systems of plaintiff and defendant companies, and generally upon the technical matters involved in the proposed connection and use of the lines of the defendant by the plaintiff. In accordance with this request, by the court, a number of skilled telephone engineers gave their testimony. Thereafter argument was had and the matter submitted to the court.

The constitutional and statutory provisions pertinent to the issues are as follows:

Section 9, Article XV, constitution of Montana. The right of eminent domain shall never be abridged, nor so constructed as to prevent the legislative assembly from taking the property and franchises of incorporated companies, and subjecting them to public use the same as the property of individuals; and the police power of the state shall never be abridged or so construed as to permit corporations to conduct their business in such manner as to infringe the equal rights of individuals, or the general well-being of the state."

"Section 14, Article XV, constitution of Montana. Any association or corporation, or the lessees or managers thereof, organized for the purpose, or any individual, shall have the right to construct or maintain lines of telegraph or telephone within this state, and connect the same with other lines; and the legislative assembly shall by general law of uniform operation provide reasonable regulations to give full effect to this section. No telegraph or telephone company shall consolidate with, or hold a controlling interest in the stock or bonds of any other telegraph or telephone company owning or having the control of a competing line, or acquire by purchase or otherwise any competing line of telegraph or telephone."

Then follow the sections of the codes making these basic law requirements effective, as well as quotations from the code showing the right of eminent domain may be exercised in behalf of telephone or electric light lines. It next quotes the code of civil procedure showing that before property can be taken it must appear that the use to which it is to be applied is a use authorized by law; that the taking is necessary to such use, and if already appropriated to some public use that the public use to which it is to be applied is a more nesessary public use. The opinion next quotes the code of civil procedure to show the power of courts or judges to regulate and determine the place and manner of making the connection and crossings, to determine whether or not the use for which the property is sought to be appropriated is a public use; to limit the amount of property sought to be

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appropriated and an authorization for the appointment of commissioners to ascertain and determine the amount to be paid by the plaintiff to owners and interested persons as damages by reason of the appropriation. Continuing, it says:

It is very clear that plaintiff has a right under the constitution of the state to connect its telephone line with defendant's. "Full effect" by uniform law providing reasonable regulation, is required to be given to the provision giving the right to connect. Certainly some force and effect to this constitutional right of connection were intended by the action of the legislative assembly in enacting section 1001, civil code, proceeding under the mandate of the constitution. The question is, therefore, what effect has been given, and to what extent has legislative action been had?

A mere physical connection of telephone systems is no advantage unless right of use is enjoyed. By the very nature of the property, the only substantial way to enjoy the connection is to be able to use the lines when in connection. I am disposed to think, upon full consideration, that the right of connection granted by the constitution means in telephony more than mere mechanical union and contemplates use as a necessary incident to the right to connect, and that the statute, in employing the word "use," might be accepted as an interpretation of the constitutional authority is too broad, it cannot be doubted that the legislature kept within its power when it provided for acquiring a right of use, even though such right might be an extension of constitutional authority.

The right to be acquired must be regarded in its relation to the character of the thing used; and, while rights of property should always be scrupulously protected, by strict construction of laws conferring power of appropriation of the property of a person for public use, no construction of a substantial privilege should be adopted, which, in its practical effect, would deny the benefit expressly, and clearly intended. I think that the use that may be acquired by the plaintiff company is such as is practicable by a connection like that had in the every day service with defendant's own connections. This is feasible by a plan of trunking between the exchanges, where the respective switch or toll boards are maintained. The defendant company would then receive the business from the plaintiff as it now receives business coming from one of its own subscribers.

Electricians of experience say that it is neither against scientific rules, nor uncommon, in practical telephony, to find one telephone plant connected with toll lines of other systems; that the matter of current is practically the same in talking on all systems; and that, if the established circuits cannot do the business, the method of taking care of increased business or an overload is by stringing more circuits.

The operators of defendant company would have to be made use of to make such service practical, the additional service that the defendant's operators would have to perform being that of "plugging in," answering and getting the connection. But, in effect, the same process is required to be used for a patron of the defendant company's exchange, so that the question is really resolved into one of detail and is not one of practicability. It may even be that, owing to possible differences in the switchboards of the two companies, an auxiliary apparatus will be necessary, but that is also a matter of mechanical adjustment, not unusual or at all difficult of arrangement.

The right to the use is the thing the law has said may be acquired. Therefore where appropriate proceedings are instituted, as in this case, it is the right of use that is to be acquired; and the reasonable, practical method by which the right may be enjoyed is use by a connection so made that one company, by its operators, may call the operators of another company, which must receive the long distance business of the subscribers of the plaintiff company, and care for the same very much as it would like business of its own patrons. In other words, where two companies owning different lines of telephones in Montana cannot agree upon the compensation for the privilege of connection and use, the law of Montana obliges the one to submit to the connection with the other, and (upon payment of damages to be assessed) to accept a patronage, and to submit to a necessary use that it might not wish to accept or allow, and probably could not be compelled to accept or allow, were it not for the provisions of the constitution and laws of the state.

It would be too narrow a view of the constitutional provision and the law to say that the right of connection and use is satisfied by mere physical union of the telephone wires and mere adjustment of the same. Right of connection and use means the privilege of having the business proffered accepted and efficiently cared for by the receiving company, through its agents or operators, substantially as would be the business proffered by one of its own subscribers.

No questions of complicated traffic arrangements enter into the consideration of the matter as it now stands before the court. Difficulties of such a nature may arise hereafter, but they can be surmounted when the principle is recognized that the spirit of the constitution and the letter of the laws of the state, in which the defendant operates its lines, compel it, under its primal duty to the public, to yield to the right of the plaintiff company to connect its lines with the defendant's, and to enjoy the use thereof in a reasonable and effective way, provided of course, damages are paid, as required by law.

From these views, it follows that plaintiff is within its rights when it invokes the power of eminent domain for proposed long distance telephone connections, which is a clearly defined public use. The use sought is convenient and of great benefit to the public. There will be no taking in the sense of exclusion of defendant company from enjoyment of control of its property; but rather a limited use such as a company operating a telephone system offers to and necessarily surrenders to a patron when its line is being used for conversation. Defendant having erected its system subject to reasonable impositions that might be put upon it by the constitution and laws of the state, is under a duty to allow such a connection and use as is outlined above.

The motion is granted.

Realizing the full purport of Judge Hunt's decision from the viewpoint of the Independent operators, the editor of Sound Waves asked for an expression from various operators in different parts of the United States. The consensus of opinion is reflected in the following letters:

Editor Sound Waves: The Bell Telephone Company is entrenched all over the country with local and long distance lines. It is the object of the Independent telephone movement to become as thoroughly entrenched. In other words, Independents desire to give every man in the country a telephone connected with Independent long distance lines. In order to do this, Independents must have the whole field. Any break in territory will make a weak link and inasmuch as no chain is stronger than its weaker link, the least break would cast reflection on the Independent proposition as a whole. Such a decision is bound to affect the value of securities of the Independent companies and will lose to them the confidence of the public in the stability of the movement. It will tend to discourage and dishearten those already in the field and will, in my judgment, if persisted in to a large extent, in the course of time, entirely destroy our business.

I am opposed to the general proposition of physical connection with the Bell Telephone Company.—*C. W. Kline, Hazelton, Pa.*

Editor Sound Waves: I think it has been demonstrated that competition in the telephone business has brought about good results. It not only improves the service, but reduces the rate. Should the Independents allow their different plants to connect with the Bell long distance, since the latter have such an extensive service, the Bell would get most all of the business. I do not think this would be fair to the Independent long distance companies, since they have been working for such a long time to build up the Independent plants by giving connection when the Bell people absolutely refused to connect with them. The only motive the Bell people now have in offering to connect up with the Independents is that they think by doing so they will keep the latter from building any new exchanges in any of the territory that is not now occupied by them. Here in Ohio that would mean Cincinnati, and in Illinois, Chicago, and they hope to thwart our movements by giving these connections to the Independents through their own exchanges. I do not think the Independents at this time could afford to make any such move.—*E. L. Barber, Wauseon, Ohio.*

Editor Sound Waves: In a majority of the places where Independent telephones have been successful, operators have been able to secure many more telephones than the Bell Company. Compulsory connection would give the Bell Company the advantage of securing connection with all the Independent telephones and I am certain there would not be a like advantage for the Independents.

The Bell Company, by reason of its being controlled by one central organization at Boston, can act as a unit in every part of the United States, and with each subsidiary company. It would have the power, where it wished, to give good service to the Independent companies and treat them fine. In other places where there was strong competition and both companies were about equal, the Bell would undoubtedly see that the Independent company got poor service over Bell lines; that they did not

get their calls through quickly, and that the Independent subscribers met with all sorts of delay in getting long distance calls, and in this way throw all the advantage to its own system and its subscribers. I know this has been done in several places in Indiana where the Bell has been able in some way to secure control of the local situation.

Another reason is that if this was done there would be no incentive for capital to go ahead with the construction of Independent toll lines, or additional construction to present lines, and in time the Bell could purchase at their own price. With the Bell in complete control of the long distance situation it might then secure an amendement to all the state laws and do away with the compulsory connection, and might then be able to buy out a great many Independent plants at its own price.

One who has studied this situation of compulsory connection, or one who has been connected with Independent systems and had the Bell as a competitor for a number of years, can find innumerable objections. In fact, there are nothing but objections to the matter of compulsory connection, as it would affect the general Independent interests; not only an occasional company, but the general Independent telephone interests would suffer immeasurable hurt, through compulsory or any other inter-connection.

In my opinion what the Independents need is the strongest kind of organization and every leader among Independent telephone interests should devote his efforts to secure compulsory alliance between Independent companies, and to tying Independent interests together in such a way that while each would own its own property individually, they would be united the same as the Bell interests.

If such a union can be brought about, I am satisfied that it is only a question of time until the Bell would be willing to treat the telephone business as the railroads treat the railroad business. That is, to do away with cut-throat competition and place the telephone upon a profitable and businesslike basis everywhere in the United States. I believe without doubt that all leading telephone interests are anxious to see the general cause of telephony advanced and that the cut-throat and cut-rate competition should be done away with, and that the business should be handled the same as railroads handle their business. That is, to handle the telephone business in a way to give the best possible service and receive a good remuneration for that business.—*James S. Brailey, Jr., Toledo, Ohio.*

Troubles on Common Battery Exchanges

By Arthur Bessey Smith

ALTHOUGH common battery switchboards are now made in a great variety of forms, there are some general principles which underly them all. Any man who has obtained a good understanding of one make ought to find no difficulty in mastering the details of any other. All boards except the smallest employ a lamp signal which is operated by a line relay. The line relay in series with the battery, which is common to all subscribers, and the line lamp constitute the signalling apparatus for a line. To remove this signalling apparatus from the line when the operator answers is the work of the cut-off relay. The cut-off relay operates on a circuit which is entirely local to the exchange and we are thus able to say with certainty how much current it shall have. This makes its operation more certain than that of the line relay, which must work over lines of varying length. Troubles with cut-off relays are rather rare, except in the adjustment of contacts and the entrance of dust. But line relays must be very carefully adjusted to work in a satisfactory manner over a wide range. The usual test is to see that they do not stick or freeze when the line is short-circuited at the main distributing rack, and that they pull up properly and certainly when the line is closed through 1,000 to 1,200 ohms.

When a relay pulls its armature up, the latter should not touch the pole-piece. If it does, the residual magnetism will be almost sure to make it fail to release. The small air gap necessary is secured by a copper rivet or a thin strip of sheet copper. The exact form depends on the construction of the relay. It sometimes happens that the copper rivet or sheet gets misplaced, or comes off, or was never put on. The best of factories will sometimes let a matter of this kind slip through. It is then up to the switchboard man to fix it. In a hurry case, you can often fold a small piece of paper and fasten it so that it will prevent sticking till a permanent repair can be made. One of the main points in exchange operation is to keep things going. This must not be made the excuse for makeshift repairs. But it often happens that there is urgent need for the immediate repair of a certain line. If to make the repair in the regular way means an hour's delay and some simple remedy can be applied in two minutes, it is far better to use the simple remedy and keep the line working and the subscriber happy than to be so slow as to anger him. This quick repair must not be left indefinitely, for most of the makeshifts are not noted for their permanence. At the very first opportunity, make a thorough job of it so that the same trouble cannot occur again.

With regard to the resistance through which a relay will pull up, very much depends on the class of relay used. Broadly speaking, there are two classes, gravity and spring. In the former, the force of the weight of the armature alone is relied on to break the contact. This force may be very weak, in which case the relay will be more or less prone to stick or "freeze." In the latter, a spring is the restoring force. This is usually one or more of the contact springs, although in some relays it is an entirely separate spring. Spring restored relays are more positive in breaking their contacts, but are less sensitive. Consequently you must adjust them very carefully with regard to tension in the springs, so that there shall be just enough pressure to avoid sticking and not too much or it will be hard to pull up.

Most wire chief's boards are now equipped with a variety of circuits and apparatus for testing lines and switchboard parts. One of the most useful is the test line to the main rack. It terminates in a special plug designed for the particular protector with which it is intended to be used. Upon inserting this plug in the protector the wire chief can test out on the line, or in toward the switchboard, or bridge himself across the line. In some few makes of protector the heat coils must be removed before the plug can be inserted, but most protectors are free from this objection. There are six wires in the test line to the main rack, two to central, two to the line through the heat coils, and two to line direct. These end in jacks on the desk, though some are now being put out with keys. Attached to plugs which fit these jacks are numerous keys which are wired up according to a very complicated system, so that as large a number of combinations as possible may be made in testing. In addition to arrangements for both common battery and local battery talking, there is ringing current which may have a buzzer inserted in series by a key. This is to indicate whether a line is closed or open to ringing current. Also there is a voltmeter with or without battery and sometimes a battery bell in series with battery.

Suppose it is reported that a certain subscriber cannot get central. The first thing to do is to find out whether the trouble is in the office or out of it. Lack of certainty on this point has often caused the needless expenditure of money and loss of time. Unless there are special reasons, it is bad form to send a troubleman out

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on the line to find a trouble, when it proves to be in the office. Inserting the test plug in the proper line on the main frame, the first test will be to the switchboard. This is usually accomplished by listening on the cord which is plugged to the jack marked "in" and throwing a "holding coil" across the line. The holding coil is merely a retardation coil of from 100 to 500 ohms resistance. This puts the line in the same condition as if the subscriber had called, and current will flow through the line relay, pulling it up and operating the line lamp, if the office equipment is all right, you will know it by the answer of the operator. It is often a good thing to try to get her several times in succession, for trouble may be intermittent. If you fail to light the line lamp one time out of ten, there is something wrong which you must fix. But if all is right, then test to line. To the magneto man the most obvious thing to do is to see if the line is open or short by a voltmeter test, or by the bridge. But in the common battery system, the line is open at the sub-station by reason of the condenser. So we must use some other test. The buzzer in the ringing circuit is most useful for this purpose, as you can ring up the subscriber and test the continuity of the line at one operation. If the line rings closed, as indicated by the noise of the buzzer, but the subscriber does not answer, one of two things must be the matter. The subscriber is not there or there is some defect in the bell which does not break the circuit. It cannot be a break in the line, for then the buzzer would not have buzzed. It cannot be a short circuit in the line, for that would have caused the trouble to be reported as a "shiner," or a "permanent." In this way the tester can narrow the probabilities down to such a point as to make the work of the trouble shooter more easy. Even if the buzzer shows the line to be open, there is no certainty that it is outside the office, for it may be in one of the heat coils, or a bad jumper connection on the main frame. Only when you have tested and found the line and apparatus intact clear up to and into the cable can you say with reasonable certainty that it is out on the line or in the sub-station.

If the circuit tests bad to the board by failure to get the operator, one of the first tests is to examine the relays on the relay rack. If the lamp circuit is all right, pushing the line relay up with your finger will cause the line lamp to light. An instant after, you should see the cut-off relay pull up when the operator plugs in and tries to answer the supposed call. If the cut-off relay does not pull up, it may be that the fuse in the line lamp circuit is blown, or the line lamp itself may be burned out. If the lamp circuit is all right and the cut-off relay responds when you operate the line relay by hand, then it may be that the line relay does not pull up at all when the subscriber calls. Sometimes the adjustment may be so fine that it will not close the lamp circuit when operated by the regular line current, but will when pushed up by the finger. The testing desk should have various resistance coils wired into it so that you can test the relay with nearly the line current. A good range of resistances is as follows: Zero-100-500-1,000-1,500. Try the relay with weak current, say through the 1,000 ohm coil. Perhaps a slight adjustment of the springs will cure the difficulty. Or the armature may have become stiff in the pivots, or be sluggish in action from some other mechanical cause. There is a tendency to design all relays as far as possible without pivot points, so as to make them more reliable. This is a move in the right direction, for pivots have a great tendency to work loose. The knife edge construction is much freer from binding. Once in a long while there may show up a trouble which is caused by a poorly soldered jumper on the main frame or the intermediate rack, or even in the answering or multiple cables on the racks or at the jacks. These require some patience to find, for they are less suspected than other troubles and sometimes have a habit of coming and going in a very exasperating manner. To find one such joint you will be obliged to follow the suspected circuit foot by foot, testing each point both electrically and mechanically till you find it. As a switchboard gets older, these troubles should disappear.

If a line gets into such a condition that it draws current steadily from the switchboard, it shows itself by holding the line lamp bright. The tester will cut the line in two as before by getting in with the test plug on the main distributing rack. It is most natural to suspect some line trouble and hence to test out first. Plug the test cord into the "out" jack. The test cord should have a supervisory relay and lamp which may be thrown in or out by a key. These are ordinarily used for testing the operation of subscribers' instruments in their various signals, and for talking to linemen and troublemen on the line. They are in most cases a duplication of one end of the regular subscriber's operator's cord circuit, so that in all tests the same conditions will be imposed as are met with in the regular cord. As we are now testing for a line which may be short circuited, this supervisory signal will give us a very good indication. If, on plugging into the "out" jack of the test line to the main frame and throwing the supervisory relay in, the lamp lights up, we know that as far as the relay is able to determine the line is open. If, however, the relay clicks and the lamp remains dark, we have very good evidence that the line is closed. You can check it by getting in on the order wire to the operator of the right position and asking her if that line lamp is still lighted. If the trouble is only on the line, the lamp will have gone out when you cut the line in two.

Having found that the line is clear behind you (toward the switchboard), you will proceed to reason and test for the nature of the trouble on the line or in the sub-station. A little thinking will show that it may be any one of the following causes: Hook up, leaky condenser, short line, one line grounded.

The hook being up will of course throw the talking set in the telephone across the line, just as if the subscriber were talking or signalling central. It may be that some one has forgotten to hang the receiver up again, or the hook may stick for mechanical reasons. If the lever binds in the escutcheon plate or elsewhere, it may fail to break contact and so leave the transmitter connected. If this is the trouble, you can often detect it by listening for noises in the room. You will need to throw the key to cut off the battery from your transmitter, or the noise in the office, or your own breathing against the mouthpiece may prevent you from hearing. If the telephone is in a residence which is quiet, you may hear nothing. Most offices and public buildings are noisy enough to make quite a showing.

The howler is a very good device to attract the attention of the subscriber and get him to replace the receiver. The leaving of the receiver off the hook is not always an accident, for some people think it is the easiest way to keep the bell from ringing. Occasionally some lady will have an afternoon function during which she does not wish to be disturbed. So she lets the receiver hang and goes on with the festivities. I have known people to become very angry when the shrill noise of the howler disturbed the assembly, but after brief explanations as to the reasons for it, the receiver was replaced. In some instances the howler may not be sufficient to attract attention. This is the case when the receiver has

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been set on some flat surface so that the sound chamber is entirely enclosed. It is surprising to those who have not tried it how efficiently this will silence the effect of the howler. The only thing to do is to send a man after it.

If the hook has stuck from mechanical reasons, the trouble man should do a little thinking before trying to repair it. If the lever rubs hard against one side of the slot, it is usually due to a bend in the lever. Take the lever out and sight along it to get its true condition. If carefully straightened it will usually fit and work without further trouble. But if on replacing it there is still some rubbing, a small bend in the right direction will make it all right. Many telephones are now made with detachable hook levers, which make the work of the telephone man very much easier. If there is any tightness in the pivot, it will usually take a little filing to ease it. Do not file the first place which you see, but look for bright places to show where the hard rubbing is taking place. It may help to work the lever up and down several times before it is removed to make the tight spot show more plainly. Then look for it and file carefully, not taking off any more metal than necessary to get smooth, free action.

If the line is quiet, you cannot tell without further test whether the hook is up or there is some other trouble. Test the insulation of each wire separately with regard to earth and each other. In most exchanges the battery is grounded at the positive end. The line relay is then wired into the circuit in such a manner that it comes between the negative pole of battery and one of the line wires. Hence there are two line faults which will show up by lighting the line lamp, a short or a ground on the wire which is connected to the relay. This is quite an advantage, as it permits more cases of trouble to be detected and repaired before the subscriber knows it, than if the battery is not grounded or the relay is in the other side of the circuit. It makes the subscriber feel that he is being cared for if the troubles are thus headed off before they affect him. Anything which can be done to win the good will of the people you serve makes the work glide along on ball-bearings and adds to the stability of the company.

Testing lines for insulation with a voltmeter and battery is a very simple matter and easily understood. The voltmeter acts as a galvanometer, or current detector. Absence of deflection, or a sufficiently small one, indi-

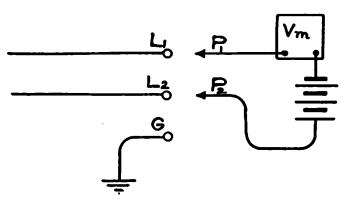

Figure 1.

cates that the insulation of the line under test is good. A strong deflection shows a leak. But if you are obliged to use the exchange battery on the voltmeter test, and if that battery is grounded, you will need to note a little point which might lead you wrong. Figure 1 shows the theoretical arrangement for the voltmeter test with the battery *not* grounded. It is clear that by applying the test points, P_1 and P_2, to the two line wires, L_1 and L_2, and the ground, G, we can tell at once of there is any connection between them. Putting the test points on L_1 and L_2 tests the insulation of the pair. Going from L_1 to ground tests the insulation of that wire.

If the pair is clear from each other, but one of them is grounded, it will not affect the test across the line. For the pair will test clear, as there is no other path for the current except through the insulation between the wires.

But if the exchange battery is grounded, we have the condition illustrated by Figure 2. With this arrangement we can test the insulation of each wire from earth by merely applying P_1 to the wire in question, for the battery has its ground connection permanent. When we come to test across the line, that is, the insulation of one wire from the other, we apply a test point to each of the lines, thus placing the battery and voltmeter in series across the line. If you know that both wires are clear

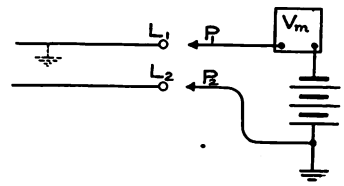

Figure 2.

from the ground, this will give you a reliable test, although in so doing you are for the time being placing a ground on one of them. Suppose we have put P_1 on L_1 and P_2 on L_2. Now if L_2 has a ground on it outside of the exchange, it will not affect our test. But if it is L_1 which is grounded, the test will apparently show the pair to be short circuited. To make a complete test which shall reveal all the facts, it is necessary first to test each wire separately for its insulation from earth. Then test across the line. If the first test showed one of the wires grounded, you will need to take care that in going across the pair you get the grounded end of battery on the faulty wire. If you do this you can rely on the result. All these tests are made by throwing keys on the test cord circuit. To work all possible combinations requires a rather complicated system of wiring. Some men are satisfied with merely learning how to operate all the keys to make the different tests without studying out the circuits and seeing for themselves how it is done. The thorough telephone man wants to go deeper. He will patiently go over all the circuits, simplifying where necessary, till he understands fully how each test is accomplished and its limitations. He will be much more likely to remember correctly all the details than if he had only followed printed directions.

If all cases of trouble were positive and clear-cut it would not be so difficult to handle them. But not all grounds are dead grounds, and they do not all stay in till they are located. A cable which is just getting damp is a good illustration of this. The line may appear all right till after a call has been made. Then the difficulty shows up by failure to supervise. Or the line lamp may light up when the operator withdraws the plug, although the subscriber has hung up. Upon testing with the voltmeter it acts in a curious manner. The needle will swing up to a point indicating a small leakage, greater than normal, then drop down by degrees till it indicates almost nothing. After throwing off the testing current and letting the line rest for a few minutes, it will act as before, the period of rest having restored the leakage. The explanation seems to be that the testing current dries the moist paper to such an extent as to restore the insulation almost to its normal state. When the voltage is removed and the current thereby cut off, the moisture accumulates and destroys the insulation. When the line is connected to the board, it is open at the sub-station. This leaves the full voltage of the battery on the cable so that the leakage current dries the moisture out to

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some extent. This prevents the line relay from being energized. But when the receiver is taken from the hook, the voltage across the cable pair is very greatly lowered, due to the short circuit effect of the talking set. While the conversation is going on, the moisture accumulates and lowers the insulation to such an extent that when the line is opened by hanging up the receiver enough current can leak through to hold the supervisory relay up. In other words, the insulation falls a little lower than the back-down resistance of the relay, consequently the relay does not back down. After a time the current dries the pair out enough to back the relay down and the trouble disappears till the next time the line is used.

In the case of a swinging short circuit or ground, you can make good use of the voltmeter or the supervisory lamp in keeping track of its performance, particularly if the trouble comes and goes several times in a minute. If you are so situated that you can watch the desk constantly, the swinging of the voltmeter needle or the flashing of the lamp will keep you informed that the trouble is yet in business. If you must work a little way off, cutting in a buzzer night alarm or bell will be better, though it is sometimes quite noisy. If you have sent a trouble man out with instructions to cut the line in two at a certain point and test to get central, the lamp or buzzer will notify you when he comes in, if the trouble is beyond him. The intermittent action will cease when he cuts the line. In the case of a swinging short it will stop when he gets across the line even if the trouble is between him and the office. His test set and the fault will be in parallel, allowing his set to hold the signal steady. But when you come to talk, you will find your conversation chopped to pieces by the wires swinging together between you and your man. If the trouble had been beyond, your talk would have been steady. A swinging ground on either wire makes intermittent noise on the line the same as on a magneto line. In addition, it will flash the line signal if it is the wire which contains the line relay.

The general principle of most three-strand common battery cord circuits is the employment of two wires for talking and a third conductor for switching and signalling. The two conductors which form the connection between the subscribers have three functions: (1) To feed battery current to the transmitters of the two subscribers, usually separately, so that the flow of current to one shall not affect the flow to the other; (2) to form a path for the voice current from one telephone to the other with as little loss of energy as possible, also to preserve the wave form; (3) to operate some device or devices which will notify the operator of the condition of each end of the cord circuit, merely with regard to the flow of current to the sub-stations. Strictly speaking, only one of these is fulfilled by the magneto cord circuit—the second point. It does not need to do the first, and the third it cannot do.

The feeding of battery current to the telephones is accomplished by a repeating coil with four windings, or a combination of retardation coils and condensers. In the former, known as the Hayes system, supervision must be secured by the insertion of a relay in series with one side of the talking circuit. The impedance of the relay is overcome by shunting it with a low resistance non-inductive coil. This makes the relay less sensitive, which is somewhat of a disadvantage. In the retardation-condenser system, each of the retardation coils can be made to act as a relay without in the least affecting its functions as a retardation coil. It leaves the line free from unbalancing influences and gives the supervisory relay a fair chance to be as sensitive as we wish to make it, and at a minimum cost.

In any case, the supervisory relay must be so constructed and adjusted that it can work successfully over any line in the exchange, for it may be used to connect any two subscribers. In this it differs from the line relay, and the switchboard man is the first to find it out. The main requisite in a line relay is that it shall pull up reliably with very small current. There is not as much trouble about its falling back, for when the operator plugs in, the circuit through it is broken absolutely and it *must* fall back. A good supervisory relay must not only pull up over the longest line, but also release very promptly when the line is opened at the far end. This allows its back-down resistance to be somewhat lower than that of a line relay. In fact, the pull-up and back-down resistances of a supervisory relay need to be somewhat closer together than for a line relay. This means a little stiffer spring pressure at the release point (in the supervisory relay), but not very much stiffer at the point of pulling up. Practical experience with the particular type of relay that you are using is necessary to enable you to do this.

As an aid in testing and adjusting supervisory relays the circuit shown in Figure 3 has been devised. It can

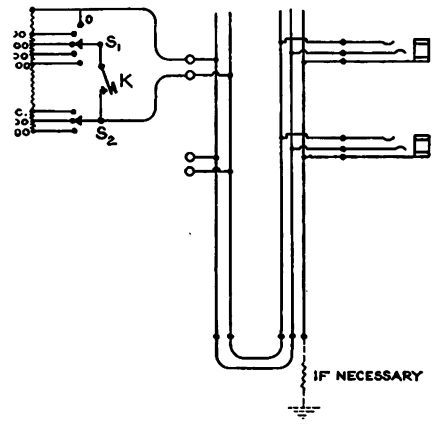

Figure 3.

be made up by any good telephone man, the main point being the winding of the high resistance. Either German silver, Climax resistance wire, or some other resistance wire which may be most accessible, may be used. No. 40 B. & S. is the most economical size to use for the high back-down coils, but for the pull-up coils No. 30 to No. 34 is better, as it will not burn out. The contact marked *O* must be wired to suit the circuit upon which you use it. If your switchboard has a low resistance, series supervisory relay, you will not make it really zero, for it might allow enough current to flow to injure the relay. Make it 25 or 30 ohms. But if your cord circuit has a 100 or 200 ohm supervisory, you can safely make it as nearly zero as a piece of No. 20 copper wire will make it. The jack should be the regular jack of your system. Whether the sleeve requires to be wired to ground through a resistance or not will depend on your circuit. If the two talking wires of the cord have independent connection to battery without any action of the third strand, so that short circuiting the tip and ring will make the supervisory relay pull-up, you will not need to ground the sleeve of the test jack. In making up the resistances you will need to work from the zero end.

First measure up and attach your 1,000-ohm section, then add a 500-ohm section, so that the total will be 1,500 ohms. Add another 500 to make the 2,000-ohm point. If you decide not to have any points on the back-

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down switch below 10,000 ohms you can get out a section having 8,000 ohms and add it to that which you have already wired in, making the total of 10,000 ohms to this point. The addition of a 5,000-ohm section will complete the series.

This arrangement of coils and switches has the advantage of economy of resistance wire, part of the back-down resistance being utilized for the pull-up resistance. In operation S_1 and S_2 are placed on any point, and the key K operated. If the relay fails to back down, S_2 is set too low and must be raised. If the relay fails to pull up, S_1 is too high and should be lowered. When the limits of the relay's action have been determined, you can throw S_1 on the zero point and test its sticking. For convenience, a vacant pair in the multiple can be utilized, thus giving you a test jack within reach of every position at the board. Wire the switches, coils and the key into a portable box with two terminals which can be connected to multiples at convenient points along the back of the board.

Concerning Wood Preservative

By George H. Erich

THE matter of treating all timber in order to preserve its usefulness has been the study of many engineers in the past several years. Particularly has this entered into the field of electricity and to the telephone industry.

There are several methods of treatment, but the most successful is the vacuum or pressure treatment, in which process creosote is employed. Next in importance is the immersion application pertaining to timber being given a bath in impregnating or preserving oils. The third method is the brush treatment, in which process oils are also used.

GEORGE H. ERICH.

The vacuum treatment is the most expensive on account of the necessary machinery required, and this method will become popular only where large quantities of timber are to be treated and it is the intention of owners of such treating plants to sell treated wood. For the ordinary man who has only a limited quantity of poles, ties and crossarms to treat the bath in impregnating oils is the cheapest and all that is required is a steel tank large enough to take in the size of the timber to be treated. In the case of poles which need only to be treated at the butts a two-coat brush treatment is sufficient, providing the man who handles the brush sees to it that the checks in the pole are filled. It is also well to treat all gains and roofs of poles.

There are many men in the telephone business today who are, no doubt, anxious to find out what a wood preservative really is, and who would think a great deal more of the treatment of their poles and their timber were they made acquainted with the proper facts. The writer has been unable to find an article in any journal which sets forth why a so-called preservative preserves, and I hope that I shall have explained in this article why some compounds preserve and others do not, at least for any great length of time.

Many men have painted their poles and crossarms with either lead paint or tar, thinking that would preserve them. It does, but only on the outside, for the inside will dry rot and weaken the pole. Applying the paint or tar merely closes the pores of the wood, sealing in all moisture contained in the timber, and as all rot is caused by germs, no matter whether in the wood or anything else which has life, these germs cannot escape, consequently they must die in the heart of the timber, causing the wood to decay to powder.

A wood preservative must be an element which leaves the pores of the wood open, and at the same time penetrates to a considerable depth. If it should not have the power of penetration it will wash off. Lead paints or heavy tars are not a preserver in a true sense. They only preserve the surface of the wood for the time being. Creosote applied in any other manner than through pressure will not penetrate timber, for it will remain on the surface and can be scraped off with a knife or washed off with water. It remains, then, that high boiling oils of great specific gravity and containing less of the volatile oils, and only 2 or 3 per cent of tar acids, are the best and cheapest elements for the preservation of wood. Compounds containing chloride of zinc will preserve for a time, but those compounds having zinc solution would be soluble in water and would naturally bleach out. Compounds, no matter what their name or brand, should conform to certain specifications and every buyer of wood preservatives should have the manufacturer he buys from supply him with analysis of his goods. This analysis should be compared with the specifications for wood preserver, or carbolinium.

Analyses of various preservatives made by different manufacturers have been made by the engineering department of the American T. & T. Company. Probably no other user has gone so far into the subject and it is interesting to know that the conclusions of this company require that carbolinium must conform to the following specifications and not contain more than 2 per cent of tar acids:

Specific gravity at 20° C.	1.12
Flashing point	149° C.
Burning point	175° C.
Distillate up to 235° C.	.40%
Loss	.00
Distillate between 235° C. and 300° C.	.10%
Residue	89.6%
No separation of solids from 0° C. to 5° C.	
Tar acids	1.3% to 2%

Besides adhering to the foregoing table of specifications two essentials should be borne in mind, viz.: (1)

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always ask for wood preserver; (2) carbolinium, the word, is public property.

There are so many questions which can be brought up, as, for instance: The depth of necessary penetration to obtain results; the application of the preserver; the cost of treatment as per tie, pole, or per foot; the length of life obtained by using the article; the danger to persons who are directly applying it; and a hundred others.

As far back in history as can be traced the best known chemists of Europe have maintained that the

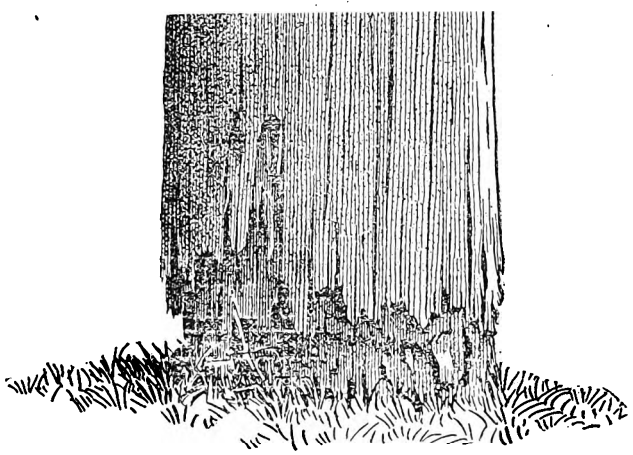

Figure 1.—Untreated chestnut pole, showing decay at ground line after six years' service. (Drawn from a photograph.)

more of the high boiling oils contained in wood preservation the better the compound.

The best grades of carbolinium contain about 90 per cent of preservative elements and these grades you should use, for they are the cheapest in the end, and should increase the life of wood at least 100 per cent, no matter in what climate used. In the west and south and in the tropical countries the life of timber which is subjected to climatic changes is very short, and the men of these districts have been engaged in the treatment of their wood structures for many years.

The price of timber is advancing so rapidly, due to the scarcity of the article, that many northern companies are now treating their poles in order to get longer life out of them, and I dare say that within a few years all persons engaged in the electrical and telephone industries will be applying some meritorious preserver to their timber.

It is a matter of paramount importance in the expense of the maintenance of any plant, and everyone should become familiar with the subject and study it.

The United States government is interested in the preservation of timber, and I wish to quote a statement by William L. Hall of the Forest Service. He says: "It is well known that a thorough impregnation with a good grade of creosote will render wood immune to decay for a long term of years, and judging from the condition of the butts of the poles, after treatment by open tank process and from our knowledge of the antiseptic qualities of the preservative, there can be little doubt as to the securing of a decided increase in life."

The best grades of preservatives are those made in Germany, and these contain the high boiling oils of coal tar, commonly called carbolinium.

According to the greatest authority in the world on the preservation of timber, Samuel B. Boulton, it is the high boiling oils that bring the best results. It makes no difference whether these high boiling oils are in creosote or other products.

It is true that chloride of zinc treatment has brought results, but this was not applied with a brush. The chloride of zinc was a solution of about 5 per cent chloride of zinc and 95 per cent water, and was forced or injected into the timber under pressure. That treatment is commercially known as the Burnettizing process. In high, dry altitudes it has brought very good results on ties, but where the rainfall is of any great consequence it has been found unprofitable. Some of the largest users of that process have discarded it for that reason.

While any article that is a germicide will prevent the rotting of timber it must be borne in mind that the article which will prevent rot or decay the greatest length of time, or the one wherefrom the best results will be derived, is the article which contains the largest amount of high boiling coal tar oils. Therefore, when one is considering the use of a preservative, they should always procure that which shows the least amount of distillate at a temperature up to 300 degrees C. It is just as cheap to apply a good preservative as a poor one, hence you will see the reasons for such precaution.

In the Forest Service circular No. 4 Carl G. Crawford, chief of the office of wood preservation, says: "Though the length of time added to the service of poles cannot now be stated, enough is known regarding the value of preservatives as preventives of decay to justify a conclusion as to whether the added life will repay the cost of treatment.

"By the brush method the average cost per pole was about 40 cents, or 29 cents in the case of creosote, of which 7 cents stands for the cost of oil. By the open-tank process the average cost per pole with creosote was 67 cents, of which 22 cents stands for the cost of oil.

"Assuming that the cost of a standard 30-foot pole at the setting hole is $8, and that, untreated, it will last twelve years, the added life necessary to repay the cost of treatment with creosote by the brush method will be about six months and by the open-tank method about one year. A very conservative estimate of the added life by the brush method is thought to be three years, which

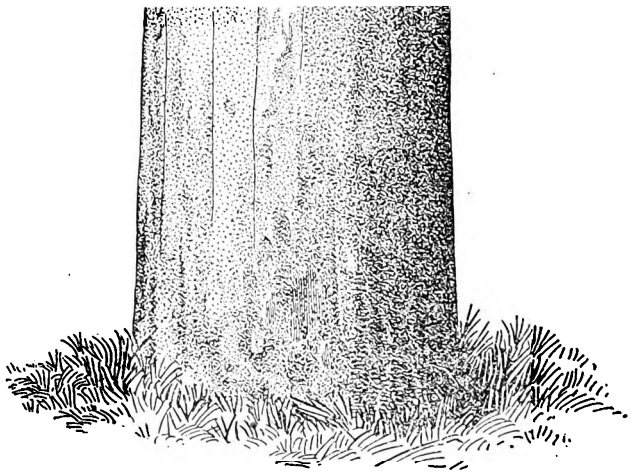

Figure 2.—Treated pine pole, showing no decay after eighteen years' service. (Drawn from a photograph.)

would mean a great saving. In the tank treatment three times as much oil was absorbed as in the brush treatment, and the penetration was at least three times as great. If it results in prolonging the life of the pole in proportion to the oil absorbed, then it will be a very efficient treatment, and the economy of its use will be very great, not only in comparison with no treatment, but in comparison with the brush treatment. The manner in which preservative treatment serves to prolong the life of a pole is strikingly shown by Figures 1 and 2."

The Law and the Telephone

By George H. Murdoch, Jr.

CONDEMNING PROPERTY FOR LINE.—The Bell Telephone Company of Buffalo has been having lots of trouble in the courts condemning a right of way for its line on the road abutting property of Albert H. Parker in the town of Pittsfield, N. Y.

In its petition it described the property desired to be condemned as "An easement or right of way for the erection, maintenance, and operation of a line of telephone through the public highway situate in the town of Pittsfield, Monroe county, New York, commonly known as the 'Pittsfield and Lima road,' which said highway passes through the premises hereinafter referred to; said line to consist of eight poles, twenty-eight feet or thereabouts, above the surface of the ground, with seven cross arms, each ten feet in length, the lowest of said cross arms to be at least eighteen feet above the surface of the ground, and each of said poles to be twelve inches, or thereabouts, in diameter at the bottom and from six to eight inches in diameter at the top; with the right to trim trees as may be necessary to protect said line from interference; with the right to attach the necessary cables or wires thereto. Said poles to be set at the places indicated on the map, which is hereby referred to and made a part of this petition."

Objections were made to the petition as insufficient, and the objections were sustained in special term, with leave to amend. The company appealed from this and got an order of reversal in the appellate division. The Court of Appeals has, however, reversed the last order and sustained the decision of the first court in an opinion in part as follows:

"It seems to me that the well-established rules of law would be disregarded if it were to be held in a condemnation proceeding to acquire property for the construction of a telephone line, that it was sufficient to describe the proposed interference with growing trees upon the premises of the landowner merely as 'the right to trim such trees as may be necessary to protect said line from interference.' Such a statement conveys no idea of the extent of the contemplated invasion. In the present proceeding, while the location of the poles and the situation of the cross bars thereon would give the property owner all needful information as to the proximity of the poles to the trees along the route, he would be left wholly in the dark as to the distance which the telephone company proposed to maintain between the wires and any portions of such trees as 'necessary to protect said line from interference.' He might suppose, for example, that if a tree was so trimmed that no branches would approach within a foot of the line, the safety of the line would be maintained, whereas, on the other hand, the officers of the telephone company might insist that it was essential to safety to trim away a tree so that no part of it should be nearer than five feet or ten feet from the line. The precise distance which the condemning party deems necessary to maintain the safety of the line must be actually known to the officers or engineers of this telephone company. That distance will have to be disclosed to the commissioners in order to enable them justly and fairly to assess the damage sustained by the property owner, and it should be stated in the petition in order that the property owner may be informed in advance as to the extent of the interest which the condemning party seeks to acquire, and in order that the commissioners may be similarly guided in measuring their award. —79 N. E. 1010.

PROXIMITY OF WIRES TO DANGEROUS CURRENT.—In an action by Eliza Thomas against the Citizens' Telephone Company in the district court of Harris county, Texas, to recover damages on account of the death of her husband, Jesse Thomas, alleged to have been caused by coming in contact with one of the defendant's wires, which was broken and down, the evidence established the following facts:

The wires of the company were strung on poles above and over the wires of a lighting and power company in such a way that in case of a break in the telephone wire it would fall upon the wires of the lighting and power company. No means were used to prevent the wire from falling upon the wires of the lighting and power company in case of a break. The company's wire carried a very light current of electricity, not sufficient to injure a person coming in contact with it; but the wires of the lighting and power company carried a very heavy current, sufficient to cause the death of any person who should come in contact therewith. As early as 8 o'clock p. m. on the day before the accident the wire of the telephone company was broken and lay upon the street near Halverton's store. About 6 o'clock a. m. the next day a mule being driven along the street came in contact with the fallen wire and was knocked down and slightly injured. Otto Lutz broke the wire and extricated the mule, and, in order to remove the wire from the street where it lay, wrapped it around a post to which was attached a guy wire of the lighting and power company. About two hours afterward Jesse Thomas, in hitching his horse to this post, came in contact with the wire and was killed. The wire in falling had fallen upon the wires of the lighting and power company, and was thereby charged with sufficient of the current of those wires to cause death to anyone coming in contact with it.

In the trial court Mrs. Thomas recovered a judgment for $2,000, and this has been affirmed by the Court of Civil Appeals in an opinion which is in part as follows:

"The facts made a prima facia case of actionable negligence against appellant. It was its duty to maintain its system of electric wires so that they should not endanger the lives of others or interfere with their lawful use of the public highway. It was its duty primarily to keep its wires off of the street where persons would likely come in contact with them; and if by any chance any of its wires should happen to be broken, and in such condition become liable to cause injury to others, it was its duty to exercise ordinary care and diligence to ascertain such fact and to remedy the defect. These duties come under the head of non-assignable duties, the negligence in the performance of which was the negligence of the appellant; and, if death resulted by reason thereof, appellant cannot escape the consequences upon the plea that such negligence is due to the fault of its agents or servants.

"But, if there was negligence at all, the evidence does not suggest that it was due to the fault or failure in duty on the part of any servant of appellant. The evidence shows that appellant had a man, called the wire chief, whose duty it was to exercise a general super-

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vision of the wires, and two trouble men, whose duty it was to correct and remove any trouble with regard to the wires when reported. It was also the duty of these trouble men, who were also inspectors, to inspect the lines; but it was shown that this duty embraced nothing more than to make such examination of the wires as they could from the ground, as they went about adjusting such troubles as were reported. One such inspector or trouble man had charge of all the wires of appellant in the First, Sixth, Third and Fifth wards of the city of Houston. By the rules of the company the wire chief and inspectors went off duty at 5:30 p. m. and did not come on again until 7:30 a. m., and during the interval there was no one to whom any defect or accident to any of the wires could be reported, nor whose duty it was to discover or remedy it. The evidence was sufficient to support the inference of negligence both in the original breaking and in the delay in discovering and removing the dangerous wire, and there is no suggestion in the evidence that such negligence was due to any fault on the part of any agent or servant of appellant, if such fact would exonerate it from liability. The telephone wire was so constructed as rendered it probable, if not inevitable, that in falling it would fall upon or across the wire of the lighting and power company and become charged with a sufficient current of electricity from this source to make it dangerous, and under the circumstances appellant must be held to the same degree of care as though its own wire were charged originally with such current. The place was a very much used street in a populous and busy city, and the wire was allowed to remain in this dangerous condition from 8 o'clock p. m. to 8 o'clock a. m. the next morning, at which time Thomas was killed. It is true that appellant was only required to use ordinary care; but such care must be proportioned to the circumstances of the case and the character and extent of the danger."

With reference to the contention of the defense that not the negligence of appellant, but the act of Lutz in taking the wire up out of the street, was the proximate cause of the death of Thomas, the court said:

"This contention cannot be sustained. Given the circumstances of the wire lying in the street, an obstruction, and, as shown by the accident to the mule, a dangerous obstruction, to travel, it was reasonably to be anticipated as a thing likely to occur that some thoughtful and considerate passer-by would take up the wire and endeavor to put it out of the way. It would be absurd to hold that appallant had a right to assume that the fallen wire would be allowed to remain upon the street, and that it could not reasonably anticipate that some one would remove it."—99 S. W. 879.

RIGHT OF WAY—BONA FIDE PURCHASER.—Where plaintiff was a *bona fide* assignee of a right of way for the maintenance of a telephone line, it was not bound by an alleged oral agreement between the original parties to the deed conveying such right of way, that the line should be used only for the benefit of the grantee in connection with its waterworks plant.

The grant of a right of way to maintain a telephone line over certain premises conferred on the grantee the right to construct a single line of poles, and to place thereon any number of cross-arms and wires—*Northwestern Telephone & Telegraph Company* v. *Hepburn*, 65 A. (N. J.) 747.

TELEPHONE CONVERSATIONS IN EVIDENCE.—Evidence as to what a person holding a conversation over the telephone told witness was said by the person at the other end of the line is hearsay, and is not rendered admissible by a subsequent statement to witness by such other person that he had received the information which was telephoned to him at the time such conversation took place. —*Texas & Pacific Ry. Co. et al.* v. *Felker*, 99 S. W. (Tex.) 439.

* * *

Where, in an action against a corporation to recover a bill for advertising, the issue was whether the corporation had authorized the insertion of the advertisement, it was proper to permit one of plaintiff's staff to testify that he was called up over the telephone by a person asking about the advertisement, and speaking of it as one "we are putting in" and that the person gave his name as the name of the corporation's president, and stated that he was the president, although the president was unknown to the witness.—*Kansas City Star Company* v. *Standard Warehouse Company*, 99 S. W. (Mo.) 765.

New Hampshire Independents.

About 60 members of the Vermont and New Hampshire Independent Telephone Association held their fifth semi-annual meeting at Bradford July 9 and 10.

A proposition was submitted that the Independent companies combine for the construction of long distance lines and this was approved.

A paper on the growth of the Independent movement last year was read in which the Bell policy was assailed and the association was urged to refrain from affiliation with the organization. An able address was made on the need of looking after the Independent interests in the legislatures of Vermont and New Hampshire. It was proposed as a means of revenue that the supply houses selling to Independent companies and belonging to the association pay into the treasury a percentage of all material sold in consideration of the companies agreeing to buy only from such houses.

Ohio Independents.

"No compromise with the Bell Company, either in the long distance or the local field," was the slogan adopted by the district meeting of the Ohio Independent Telephone Association in special session at the Southern Hotel, Columbus, Ohio, August 6.

The meeting was the largest gathering of Independent telephone men ever held in Ohio, the attendance at any of the annual meetings of the association being exceeded. More than 350 Independent telephone men gathered in the assembly room and all the action taken was unanimous.

Resolutions adopted mean that the association will invoke the Valentine anti-trust law against any company which enters into a contract with the Bell Company for the retirement of the latter from the local field in exchange for the long distance business of the Independent company.

Unique Japanese Enterprise.

The Japanese are planning to construct a long distance telephone from Tokio to Fujiyama, the famous high mountain of Nippon. Fujiyama, which is about 12,365 feet in height, is becoming a favorite resort for daring tourists, as well as Japanese students and mountain climbers. It is proposed to make the place less remote than formerly, by the construction of the long distance telephone system.

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A Study of Telephone Generators

Showing a Comparison Between Electrometer Methods and the Use of the Oscillograph in Determining the Voltage, Current and Wave Forms of Various Machines

By G. W. Wilder

TEN telephone magneto generators furnished by ten different manufacturers were tested by being successively connected to a motor which ran at a uniform speed of 1,000 revolutions per minute; and an electrostatic voltmeter that gave the true voltage of the generator under test. The apparatus used was the same as that described in the April and July numbers of this magazine and the measurements for voltage were made and calculated in the same manner as for the machine therein discussed.

The ten generators were all of the same class or style, being five-bar machines for use on bridging telephones on rural party lines. They were of standard make and taken from the regular stock of each manufacturer. For the purpose of concealing their identity, the machines were all numbered and are referred to by numbers only. Messrs. R. A. Morrison and D. Lurvey took the data from which the following curves showing the voltage of the ten generators were plotted. For convenience, the curves of several machines were plotted

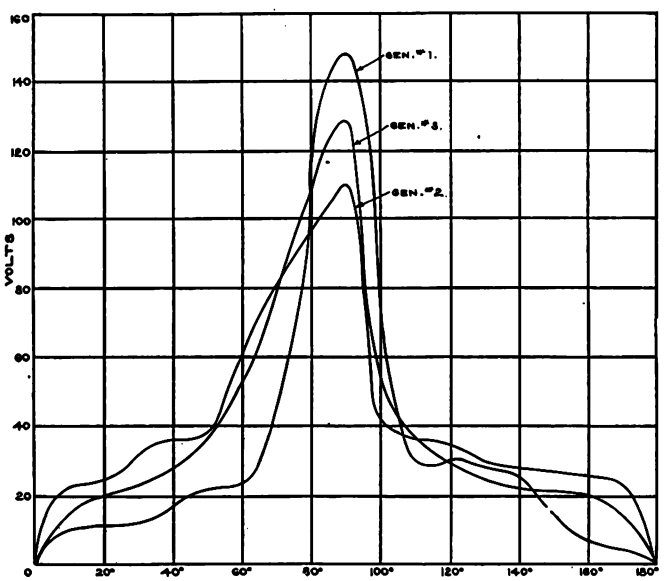

Figure 11.

upon the same sheet, thus affording an opportunity for comparison and bringing out the relative characteristics of each curve.

Curve No. 1 shows a change in voltage as the armature of the machine is revolved, similar to that of the machine described in the foregoing article of this series. At the start, the rise in voltage is gradual throughout the first 60 degrees. From 60 to 90 degrees the rise is very rapid reaching a maximum and then sinking rapidly again. After 110 degrees of the revolution have passed, the fall is gradual in two successive steps to zero degrees. The average voltage of this machine is very low although its maximum voltage is nearly 150 volts. It will be shown later on that a machine giving a curve of this type, while not particularly good for heavy non-inductive loads, is well adapted for inductive loads and is particularly good in case the ringing circuits contain condensers.

Curve No. 2 has a lower maximum voltage than Curve No. 1, but also has a higher average voltage since the increase is much more rapid at the outset and the decline at the finish is not so abrupt. This machine will

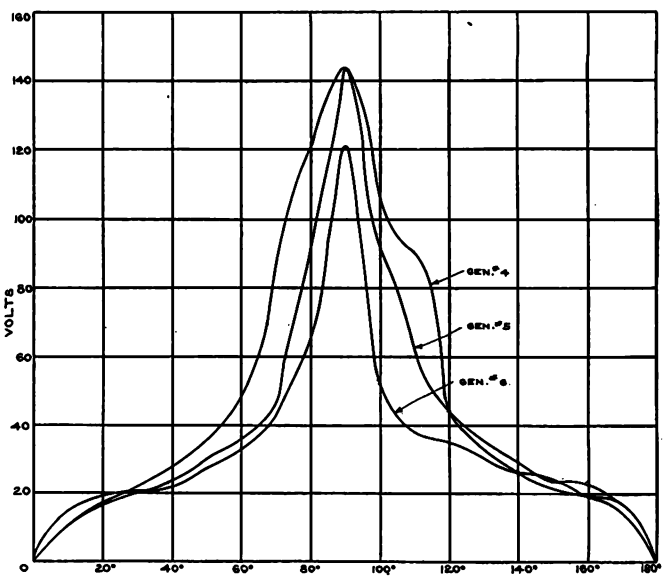

Figure 12.

give a fairly uniform fluctuating current where a commutator is provided and is particularly well adapted for selective ringing with biased ringers. The pole pieces of this machine are so shaped that the magnetic field is far from being uniform. When the wires of the armature

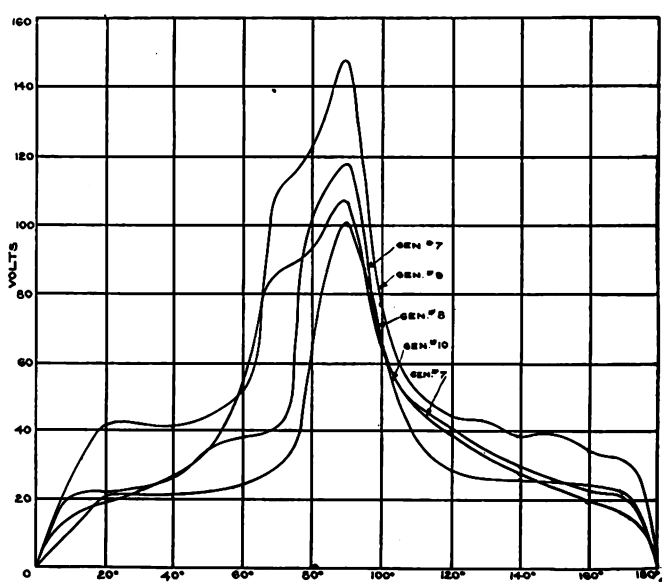

Figure 13.

pass from one side of the field to the other a sudden reversal in the direction of cutting the lines of force occurs. This sudden initial rising of the voltage, followed by the very gradual rise before the ascent of the peak

commences, causes the very noticable suddeness in drop after the peak has been passed.

Curve No. 3 shows a mean between the two preceding machines. This generator is a better all around machine than either of the two just described.

Curves 4, 5 and 6 are in general very much alike, differing some in maximum values of voltage. The rise and decay in the curves are notably the same, showing that the shape of the iron pole pieces and the armatures are nearly identical. Differences in the grade of iron used in the pole pieces and armature may be the cause of the discrepancies in the heights of the curves, although these are more probably due to differences in the permanent magnets used.

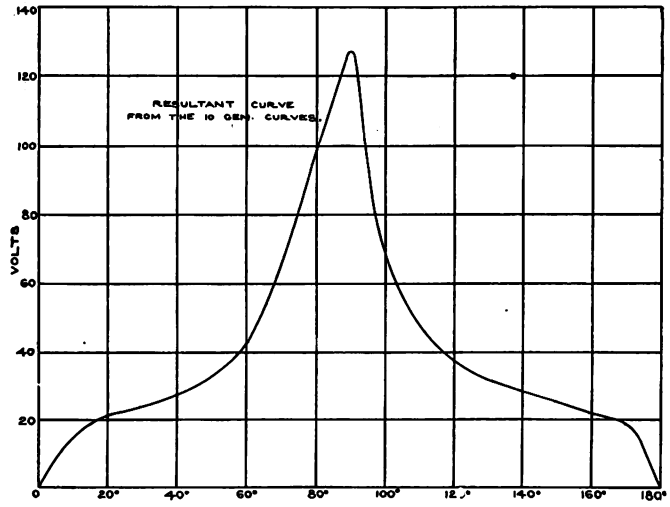

Figure 14.

Curves 7, 8, 9 and 10 show wider variations in the characteristics already described. No. 7 shows in a strong manner a machine having a high average voltage. No. 9 shows a machine giving exceedingly large values both for the maximum and for the average voltage. It might be said in connection with this machine that its magnets are softer and consequently more highly magnetized than those of the other machines. It is questionable, however, if this machine will keep up its strength as long as others since its magnets are less permanent.

The data for the above ten curves has been averaged and a resultant or composite curve drawn which is shown in Figure 14. This curve shows what might be considered as the performance of the average machine as represented by ten different manufacturers.

Measured Rate vs. Flat Rate.

BY HERBERT LAWS WEBB.

A practical telephone tariff should be based, not on the "telephone," but on the service supplied. The telephone is no more the unit of the telephone business than the knife and fork the unit of the restaurant business; the telephone is merely the means of using the service.

What the telephone user wants is telephone service, and his requirements as to the quality and quantity of service vary to an astonishing extent. One man needs to make or receive only one or two calls a day, or, perhaps, one or two a week, and he is content to share a line with others, so getting a cheap service which meets his needs. From this minimum demand the requirements of telephone service users range through a variegated scale up to those of the very large concern whose telephone traffic is measured in thousands of daily calls. To handle effectively this large daily traffic requires telephone equipment known technically as a "private branch exchange," consisting of a number of lines to the main exchange, a switchboard on the subscriber's premises, and branch telephones in all the offices or departments.

Very little consideration of the subject should convince the business man that the requirements of the customer for telephone service necessarily vary as widely as the circumstances of the people in any given community vary.

What possible argument can there be in favor of trying to meet many varying requirements by a uniform class of service, charged for at a flat rate arrived at by guesswork and applied rigidly to every customer, be he small user, medium user, or big user? It is obvious that the rate for telephone service should be based on the amount of telephone facilities and service supplied—just as a man's grocery bill depends on the quantity and quality of groceries he consumes.

The measured rate telephone tariff is based on the equitable principle of payment in proportion to service rendered. The small user (of whom there are thousands and thousands in every town) gets the limited service he requires at a low rate; under the flat rate scheme he pays —if he takes the service at all—the same rate as the large user, and really helps to pay for the large user's service. The large user gets under the measured rate tariff the elaborate facilities he requires, and the large volume of service he requires at a proportionate rate.

To put the case in a nutshell, flat rates restrict the development of the telephone service by shutting out the small user, and they impair the quality of the service by causing large users to restrict their telephone equipment and to overload their lines. Measured rates give low figures for moderate use and so open the doors to vast numbers of small users, thus increasing the development of the telephone; they make the price of telephone lines and equipment cheap (as each call pays its way), and so encourage large users to take adequate telephone equipment, thereby greatly improving the service of every user of it. The large users get their calls at a gradually descending rate, so getting the benefit which it is usual in every business to allow the wholesale customer.

The whole scheme is logical and practical. It is to the advantage of the whole of the community, as it cheapens the service to the small and moderate users, who are the great majority, and it raises the efficiency of the service. There are various other technical advantages in the measured rate system which would require much space for explanation.

The great development of the telephone service in America has been brought about mainly by the adoption of measured rates; under flat rates telephone development in America was very slow, under measured rates it has been prodigious. In Switzerland measured rates only have been in force for many years. In Scandinavia measured rates are largely used. In Germany measured rates were adopted a few years ago, and have largely increased telephone development. In Austria the administration has lately completely changed their telephone tariff and adopted measured rates; under flat rates there had been almost no development of the telephone in Austria. In France high officials of the administration have repeatedly urged the adoption of measured rates.

Competition has already accomplished a great good for Omaha. For years the regular telephone subscriber has been required to a pay a 5-cent toll for South Omaha connection. This charge has now been discontinued.

Concrete Conduit and Manhole Construction

By Oscar King

IN planning an underground telephone system, one of the fundamental essentials is to select an alley which crosses the principal streets in which to lay the trunk line of conduit. When the conduit has been laid, and before the trench is filled, sections of 1½ or 2-inch pipe should be plugged at their ends and laid in such manner that one end of each would extend into the manhole. These pipes should extend across the street into the alley each way from the manhole and by laying them while the conduit is being placed, it will not again be necessary to tear up the street.

These pipes are intended to carry the lateral cable and can be extended at any time to reach the lateral pole.

Figure 1 can readily be understood by a brief study of the code of conventions and is intended to represent a section of an imaginary city. It is obvious, from a study of the plat, that where branch conduit crosses the alleys, laterals can be extended each way to furnish service to all probable subscribers a block distant from the branch conduits. By this method, it is only necessary to traverse the alternate street.

After planning the routes for conduit, which may vary largely according to street conditions, the excavation of trenches of suitable depth and width to accommodate the conduit should proceed. The depth of the trench will depend upon the street gradient, to a large extent, but the line from one manhole to another should be as nearly straight as possible in order that the conduit may be easily rodded and the cable drawn with the least friction. Any dip in the laying of the conduit should be avoided and it is advisable that it should enter the manhole from the "up-hill" side. When manholes have sewer connection it is not material whether the conduit enters from a higher or lower elevation. The point to be observed is to prevent water from standing in the conduit.

It will be observed by referring to the plat that conduit is laid on the side of the street nearest to the telephone exchange. While this is not essential, it is a convenient method whereby it may always be known upon which side of the street the conduit is buried, obviating the necessity of referring to a map or chart.

Conduit should not be placed nearer the curb than eight feet, or the covers of the manholes will be washed by the surface drains, thus flooding ing the manholes. Having determined the exact location of manholes, the excavation should proceed from the outer edge of each and continue thus from one to another. If five-inch vitrified clay conduit is to be used, it is good practice to allow for three inches of concrete above and below and two inches at either side. It will be well to excavate for various sizes of conduit, either single or multiple, on the basis indicated, or, in other words, a 5x5-inch single duct will require a 9-inch trench; a 9x9-inch multiple duct, a 13-inch trench, etc. Care should be exercised in excavating the trench to have it conform to specifications, because needless variation will add to the cost of concrete, If water mains or gas pipes are encountered they should be wrapped with jute before the concrete is applied. This will enable their removal without injury to the concrete surrounding the conduits.

In the case of paved streets, the sand, brick or macadam should be piled at one side of the trench and the dirt on the opposite side. Space should be left at frequent intervals for wheelbarrows and passageways to handle the concrete expeditiously.

If concrete is to be mixed by hand, a platform will be needed. This can be constructed of two sheets of iron or steel, approximately 3x12 feet and 1-16 inch in thickness. These sheets should be mounted upon a platform, attached thereto by countersunk rivets, thus permitting the shovel to pass freely without encountering obstruction. Do not lap one sheet over the other. At either corner of the mixing platform attach a ring so that ropes may be passed through them, making it possible to advance the "table" as the work progresses.

A frame 3x9 feet, 8 inches deep (inside measurement) holds two-thirds of a cubic yard. Place such a frame on the mixing plate and fill it two-thirds full of crushed stone or gravel, which would pass through an inch-mesh screen. Sand should be added to fill the frame level full, after which two and one-half sacks of cement should be applied. The frame should be constructed without top or bottom so it could now be raised from the plate, leaving the ingredients for mixing. This should be turned first in a dry condition. In adding water, a little at each turn is necessary until it has become thoroughly saturated.

Begin to lay the conduit at a manhole. The application of the concrete in the trench should be attended by one man to keep the concrete evenly spread and another to tamp the mixture. Care should be taken to have uniform depth and smoothness. The first section of duct should project two inches beyond the inner surface of the manhole. The duct should be plugged to prevent dirt from entering. Figures 2 and 3 illustrate the manner of duct entrance to manhole of vault.

All conduit joints should be carefully made. A strip of jute should rest under each joint and this should have sufficient length to reach entirely around the duct. This will prevent concrete from working into the joint when it is being placed in the trench. Dowel pins should also be used to prevent the duct from twisting. After ten or more lengths of conduit have been placed, using the precautions mentioned, concrete may be dumped in upon them. Any amount of concrete in excess of three

Oscar King.

inches should be worked forward in the trench. A small iron prod properly marked will serve as a guide for depth of concrete over the duct and a hardwood tamp, 1½x1 inch and of sufficient length may be used to firmly lodge the concrete at the sides.

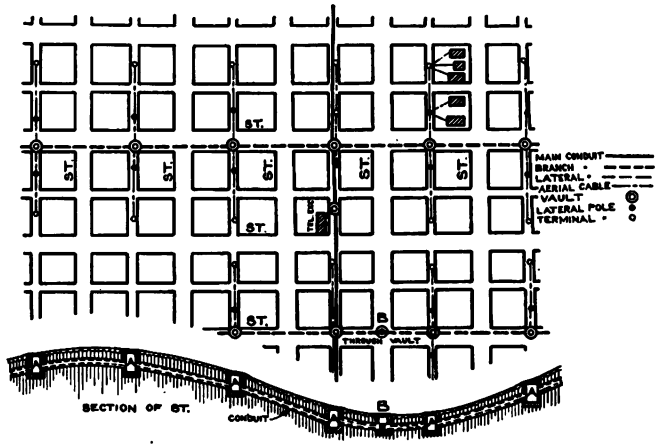

Figure 1.

The trench is then ready to be refilled without further delay. The first layer of earth should not exceed eight inches and this should be tamped hard. If tamping is done sparingly, depressions in the street will surely follow, entailing great annoyance and added expense later on.

Manhole construction will be better understood by a study of the accompanying Figures 2, 3, 4, 5 and 6. Figure 2 is a type suitable for the main trunk; Figure 3 is adapted to branches, and Figures 5 and 6 for through vault.

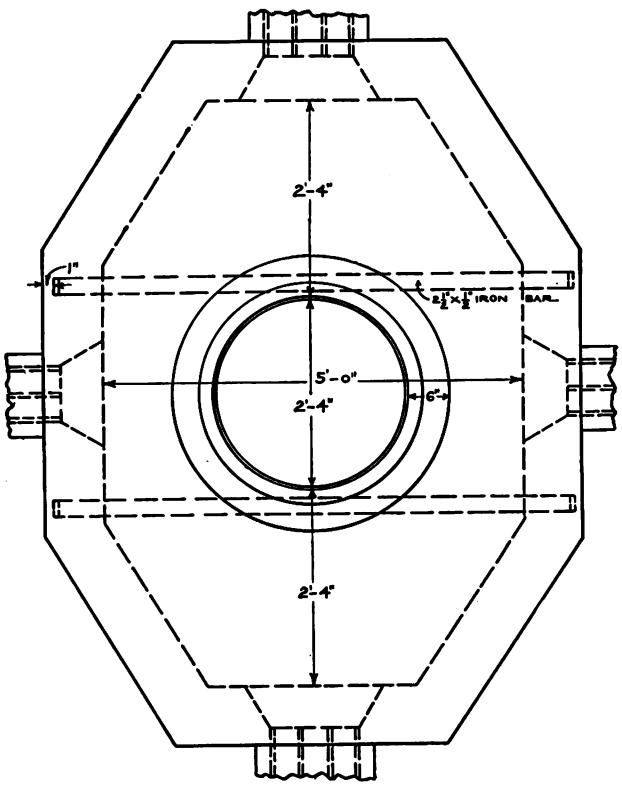

Figure 2.

For main line templet should be used in the construction, so that each edge would extend equidistant over the entering ducts. The walls should be vertical and form a perfect union with the concrete surrounding the conduit. If sewer connections are to be made the drain trap should occupy a position near the wall of the manhole. When no sewer connection can be had, a depression in the manhole should be provided, in order that a pump would remove any water that might accumulate therein.

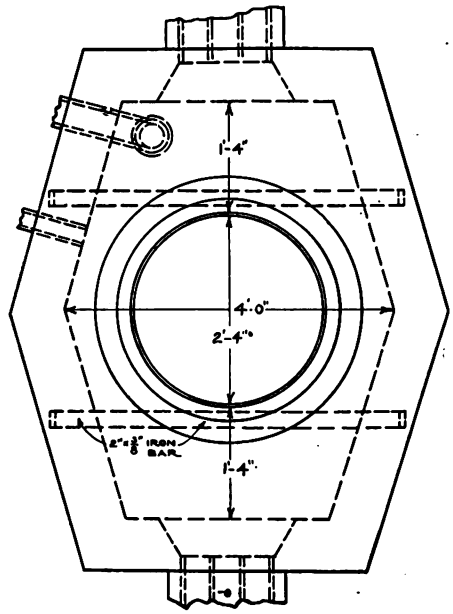

Figure 3.

The proper proportions for concrete intended to enter into the construction of manhole is one part cement, two parts sand and four parts broken rock. Enough should be mixed first for the bottom of the vault and this should be applied while moist and then tamped until the moisture has been driven out. It will then be firm enough to sustain the form for the manhole, which should be made up in advance. When the form is placed the concrete should be built up uniformly all around. Advancing the work on one side is liable to force the form out of alignment. When the entering duct is reached, short pieces of boards of suitable width can be

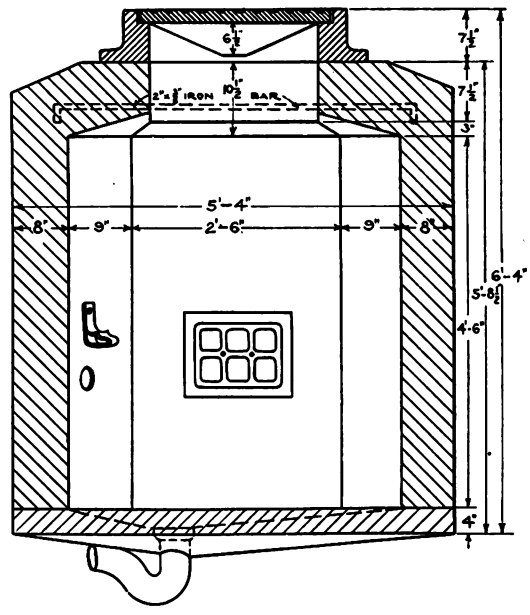

Figure 4.

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placed to form a flaring side for entering conduit. If manhole is of type shown in Figure 3 with lateral entrance, a rough board frame 12x12 inches with a depth of 8 inches should be dropped down between the dirt wall and concrete to the arm where lateral should enter. Wrought iron bars of size indicated in Figures 2 and 3 should extend across the manhole so that the flange of the cast top frame will extend over them. It is best to have the manhole deep enough in the ground to admit a layer of brick between the concrete top and the cast iron frame top. Circular lids are to be preferred. Octagonal or square lids may be dropped through the manhole entrance, which would not only subject the covering to breakage, but would possibly injure the cable as well.

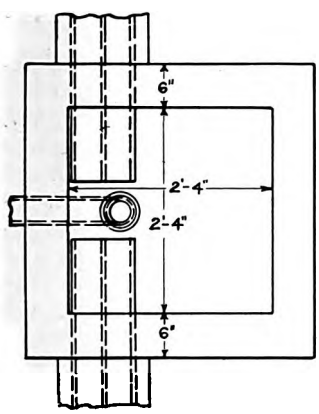

Figure 5.

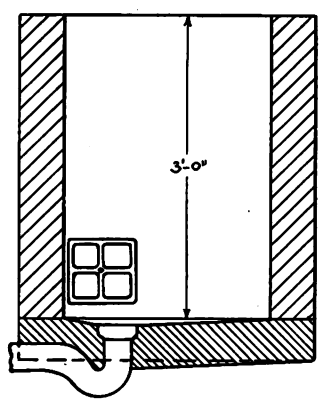

Figure 6.

Where the soil is free from stone or other impedimenta laterals can be forced from alley into the manhole with pipe jacks. By this method the necessity of reopening of the street is avoided. By cutting a trench in the alley parallel with the lateral opening in the manhole and lateral pole and long enough to receive pipe jack and section of pipe, the pipe, by the aid of a pilot, can be forced into manhole. Another section of pipe should be formed to extend up the lateral pole. Adopt dresser couplings for connections.

The opening in manhole wall where the laterals enter should be filled in with concrete. Should a manhole be located at the lowest point of depression between grades, sewer connection will be necessary. If the depression lies between manholes, a through vault should be constructed along the lines indicated in Figures 5 and 6.

International Independent Telephone Association.

Despite the prevailing hot weather, an active interest in association matters continues. Important meetings have been held in a number of the states during July and others are scheduled for August. Independent men everywhere should remember that they will be welcome at all these meetings which they can attend, whether members of the associations holding same or not.

The officers of the Canadian Independent Telephone Association announce their annual meeting for September 4th at Toronto, and extend a cordial invitation to Independent telephone men in the United States, particularly to the officers of their sister organizations, to attend and participate. The Canadian convention is being held during the Toronto exhibition so that very low railroad and steamboat rates will be in force from all parts of the United States. A hearty welcome and enjoyable time is promised all who accept the invitation.

District Meetings.—The importance of district meetings should not be overlooked by the officers of the various Independent associations. These meetings form the basis of real progress in organization work. No efforts should be spared to make them attractive and as interesting and profitable as possible. They should be held as frequently as the needs of the various associations demand; in the older and well established associations quarterly, and in the newer organizations at least semi-annually. Care should be taken in selecting the most centrally located points for the sites of district meetings, and in order to increase the interest invitations should be extended to the members of associations in neighboring states. For this reason it has been suggested that the secretaries of the various associations correspond with each other before arranging a schedule of district meetings, in order to avoid conflicting dates. District meetings should begin early in September, as soon as the vacation season is over. Your association stands ready at all times to assist in any way that it can in adding to the success of the district and state meetings.

Financial Statement—Apportionments by Executive Committee for 1907-8.

ASSOCIATIONS.

Arkansas	$ 100.00	
California	300.00	
Canada	25.00	
Illinois	750.00	
Indiana	1,000.00	
Iowa	700.00	
Kansas	400.00	
Kentucky	200.00	
Maine	25.00	
Michigan	750.00	
Missouri	500.00	
Nebraska	350.00	
New York	300.00	
North Carolina	25.00	
Ohio	1,300.00	
Oregon	40.00	
Pennsylvania	500.00	
Texas	100.00	
Vermont and New Hampshire	25.00	
Virginia	50.00	
Wisconsin	250.00	
West Virginia	250.00	
		$7,940.00

CONTRIBUTIONS AND PLEDGES.

Swbd. and tel mfrs.: Equipt. stamps	$6,500.00	
Mag. tels. and drops	$4,000.00	
C. B. tels. and drops	2,500.00	
Supply dealers and jobbers	5,000.00	
Engineers	250.00	
Journals	500.00	
Operating companies	750.00	
		$13,000.00

GENERAL.

Honorary membership fees	$ 750.00	
Miscellaneous accounts	1,027.55	
		$1,777.55
Total		$22,717.55
Paid in		100.00
Balance to be collected		$22,617.55

Annual assessment 1 per cent per unit. A unit is an operating telephone or a circuit mile of toll line. Assessments are payable monthly and are based on number of units in respective associations at last convention.

FISCAL YEAR, 1906-7, CLOSED MAY 25.

Total receipts this year to date including special committee balance	$10,654.20	
Total expenditures including accounts accrued before last convention	9,781.99	
		$872.21
Accounts payable	$ 591.98	
Estimated expenses for next thirty days	370.00	
		$961.98
Deficit in cash by August 16th		$89.77

Publicity department not started.

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The association should have a fund of $1,500 per month for the next ten months for publicity purposes and $1,000 per month for strengthening and extending the organization.

Nothing will be done by the present administration until necessary funds are pledged to defray the cost of the undertaking.

Assessments.—Call for assessments, as shown in foregoing statement, is being sent out by the secretary. The attention of officers of the various associations is called to the necessity of making prompt remittance on their assessments, so that your executive officers can carry on the important work undertaken. No definite plan can be executed until available funds are on hand to pay the cost.

Progressive Publicity.—Reiterating the suggestion made in the last bulletin, every one in the field is urged to lose no opportunity to boost the telephone business. It is only by keeping the facts constantly before the telephone using and investing public that we can hope to secure the complete recognition our business deserves, and to impress upon every one the excellent opportunities it affords for conservative investments that yield the very best returns.

Identify Your Company as Independent.—In this connection, attention is called to the importance of educating all of the people to the extent and unity of the Independent movement. Whatever may be the local name of your company, see that is is known as "The Independent Company." Call attention to this in your advertisements, news notices, circular matter, etc., and see that placards to this effect are conspicuously posted on your cable reels, poles, wagons, etc., and other outdoor construction material.

Use of the Shield.—The discontinuance of the supply department, announced in the last Bulletin, does not mean that the association attaches less importance than formerly to the use of the shield. On the contrary, no effort will be spared to increase the use of the emblem everywhere. The supply department has merely been discontinued in order to relieve the officers of your association from a certain amount of detail work, so that they may be free to devote their entire energies to other important matters demanding their attention, and because they believe that such action can be taken without interfering in the least with the continued spread of the shield, since it is felt that the various supply dealers can be depended upon to take care of the increasing demand for the emblem in its various forms. The Independent companies who are not giving shield advertising the attention it deserves should wake up to the importance of doing so, and take advantage of the special low price being made to close out the stock on hand in the supply department. Already a number of supplies have been sold out entirely. There is still a fair sized stock of others on hand, however, but in order to secure the bargains offered quick action is essential. Prices and particulars cheerfully furnished upon application.

1906 Convention Proceedings.—There is still a supply of these left, which will be furnished free upon receipt of 8 cents to cover postage. This is a very valuable book, containing important data of interest to every Independent telephone man, and a copy should be in the library or on the desk of managers everywhere.

1907 Convention Proceedings Free.—All desiring copies of the last annual convention proceedings will please write the assistant secretary at once, stating number wanted. This information is necessary in order to provide a sufficient number of copies for distribution.

International Schedule of Meetings.—It is planned to have a representative of the International Association attend all conventions of affiliated associations. To do this, it will be necessary to arrange a schedule of meetings without conflicting dates. It has been suggested that the schedule begin with the southern states in January, the various states following in the most convenient geographical order, at least ten days apart. The associations are requested to advise with the International concerning this matter before fixing dates for meetings after the Chicago convention.

Right Policy.—The right policy for every Independent telephone manager to assume is that the most and best service for the price is furnished. Remember that service is the only thing that you have to sell. Better service and not lower rates is what the people want. Therefore, it is business to see that the very best service is supplied.

Duplication of Telephone Service.—If any information is needed on this subject, an answerable argument will be furnished on application to the assistant secretary.

Cost of Service.—If you do not know what service is costing get busy and figure it out. Before you can sell a thing at a profit you must know what it costs. Information can be had along this line by addressing the president direct.

Uniform Bookkeeping.—If the Independent telephone people are to educate the investing public, it will be necessary to make intelligent statements, and before intelligent statements can be supplied, a correct and uniform bookkeeping system must be adopted.

Suggestions and Criticisms.—The officers of the association invite suggestions, pertaining to association matters occurring to the readers, from time to time, or if there is anything being done that does not meet with approval, friendly criticism is invited.

Managers Take Notice.—The International Independent Telephone Association, through its publicity department, stands ready to furnish members reading notices covering any phase of the operating field, whether to defend or boost the telephone business, increase rates, show cost of plants, or any other subject, free of charge, on application. Write today, sating your wants. Make use of the publicity department.

Theodore Gary, *President.*

July 25, 1907.

Shrink in Bell Output.

A heavy falling off in the gross and net output of its instruments during June has been recorded by the American Telegraph & Telephone Company. The gross and net output of the corporation during the first six months of the year also showed a marked diminution, but the total number of instruments outstanding at the close of June, the company reported, was materially larger than at the close of June, 1906.

The June gross output was 101,415, or 115,826 less than that for June of last year. The number returned was 83,737, or 28,764 more than that for the corresponding month of last year, while the June net output was 17,676, or 144,592 less than that for June of last year.

The company's gross output for the first half of this year amounted to 879,158, or 282,699 less than that for the corresponding period of last year. The number returned was 537,607, or 179,272 more than that for the first half of 1906, while the net output was 341,551, or 461,971 less than that for the first six months of last year.

The total number of instruments outstanding at the close of the first half of this year, however, was 7,449,387, or 947,607 more than that at the close of the first six months of 1906.

Some Questions Answered

By Arthur Bessey Smith

Instructor of Telephone Engineering, Purdue University.

EDITOR SOUND WAVES: Through the columns of your paper I wish you would give a diagram and explanation of making three lines out of two metallics, or four from three metallics. Can you get more than four from three? I have several metallic farmer lines from here on one lead and would like to know if it would be practical to try to double up on these or not. However, it is on the toll line that I want to work three from two. The one metallic line runs further than the other. Will that conflict? Must they terminate at the same point? They run parallel the entire way.

Figure 1 gives the manner in which the phantom circuit must be applied to the case as described by our correspondent. Line No. 1 is the shorter of the two metallics. R_1, R_2, etc., are the repeating coils which are

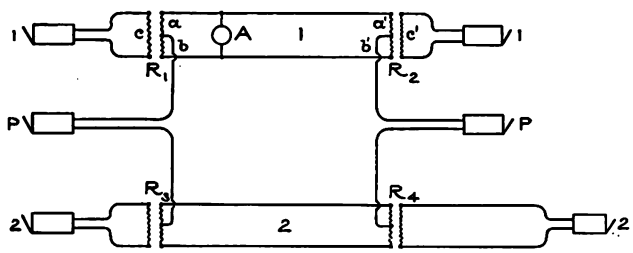

Figure 1.

inserted in the circuits at the points at which the phantom is taken off. These repeating coils must be of such design that the two halves, *a* and *b*, of each coil must be equal in resistance and inductance. Upon this depends the success of the coil in making a good phantom. The current from the phantom enters the metallic line at the center point between *a* and *b*. Here it divides, half going to each of the two wires of the metallic. At the far end of the metallic circuit the current for the phantom is taken off in the same manner, uniting at the center point of the coil. The principle of the Wheatstone bridge is involved, which prevents any of the current from the phantom circuit from passing through an intermediate station, as *A*. The intermediate station occupies the position of the galvanometer in the bridge. If the line wires are equal, and the impedances have the relation,

$$\frac{a}{b} = \frac{a'}{b'}$$

there will be no sound in the receiver of the intermediate station. If one of the line wires has a bad joint, a high resistance, it will not be able to carry its share of the current. This will make cross-talk between the phantom and the metallic. If there is a leak from one side of the metallic to earth, it will also produce cross-talk. Therefore, these are the two first conditions which must obtain in making a good phantom, equal conductivity and insulation from ground.

It requires proper construction of the coil to prevent interference between the phantom and the switchboard connection at the end of the line. The condition here is materially different from that at the intermediate stations. The current through *a* flows from the center outward to one line wire and in so doing induces an electromotive force in the winding, *c*. The current in *b* flows also from the center, but to the other line wire and in such a direction as to induce an opposite electromotive force in *c*. If these two voltages are equal, there will be no cross-talk. This depends on the proper proportion of turns and current in the two windings, *a* and *b*. This is beyond the control of the operating telephone man, and is up to the manufacturer of the coil. A further point on the coils is that they must be able to repeat ringing current as well as talking. In other words, they must be "ring through" coils. It will not be difficult to procure such a coil, as they are made by a number of prominent telephone manufacturers. As regards the ring through feature alone, the writer has tried a coil on a farmer line which had twelve telephones on it. The coil was inserted in the line at the central office on the distributing rack. The switchboard operators and the subscribers could not tell when the coil was in or out.

Place the coils on or near the cross-connecting rack so that the connections can be made by means of jumpers. Some people make these connections permanent, and for the first trials it will be best for you to do so also. But when some classes of troubles develop, it may be necessary to disconnect the phantom quickly, either to test for the trouble or to clear the line. For this purpose it is customary to wire the lines through test jacks. There

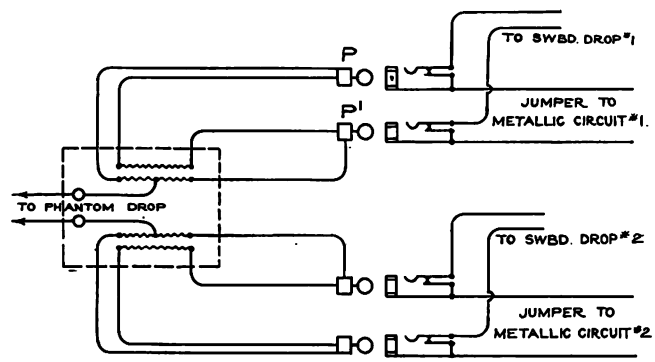

Figure 2.

are several ways of wiring up, but in Figure 2 is shown the one which I prefer. The two coils may be enclosed in a box as indicated by the broken lines, with suitable terminals for the attachment of jumpers leading to the switchboard drop of the phantom, also for the cords and plugs. The jacks may be mounted on the rack or cross-connecting board. It will be seen that in case any trouble occurs it is only necessary to pull out the plugs; this cuts out the coils and closes up the lines to their drops as if there were no phantom. This arrangement of jacks allows you to reverse the coil on the line, which is sometimes beneficial in freeing it from interference. An added advantage is that if the two jacks on line No. 1 are grouped together there can be no mistake in plugging up the phantom wrong. Since the tip of each jack is connected to the switchboard end, it makes no difference which of the two plugs, *P* or P^1, is placed in the upper jack.

If you prefer to use keys for this cut-out device, Figure 3 shows a very good arrangement. The box should contain the coils and keys with all the terminals. As drawn, the keys are thrown for connecting the phantom. To disconnect the phantom, both keys should be thrown clear over past the center to the opposite extreme. To leave the keys in their middle position will free the line of the phantom, but it will leave one winding of the repeating coil as a useless leak across the drop.

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Now, as to the practicability of putting a phantom on a farmer line, it all depends on the character of the line. If you are using semi-selective ringing, with bells

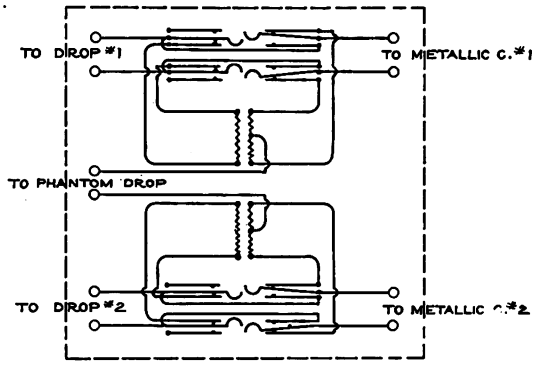

Figure 3.

bridged to ground, it is out of the question. You will be sure to get cross-rings and noise which I do not believe can be prevented. But if you are ringing all the bells bridged, and the wires are in good condition and free from tree grounds, I see no reason why it should not be made to work very well. You may get some trouble if one of the circuits is copper and the other iron. They should both be of the same material.

If the distance over which the phantom is to work is considerable, you may be obliged to transpose it as such. Figure 4 shows the idea. From the standpoint of the phantom, each of the metallic circuits is a single wire and must be carried bodily over the other one which

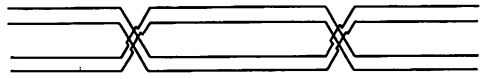

Figure 4.

forms the other side of the phantom. But I would advise you to try the phantom first without transposing and see how it works. Of course, this phantom transposition should not interfere with the regular transpositions of the metallics. It is not yet practical to work more than one phantom from two metallics.

Editor SOUND WAVES: I would like to ask a question about the buzzers which are commonly placed in the ringing leads in magneto switchboards. If these buzzers are cut off, will it make a great amount of difference in ringing? What is the resistance? I put an electric light bulb on my pole-changer and took off the resistance coil. I did this to tell if there is a ground or short on lines, or bad keys on the board. Now, does this affect the ringing power? Don't we get more volts from the pole-changer with this light on and the coil off?

The resistance offered to ringing current by the buzzer commonly inserted in the ringing wires varies somewhat with the line over which the operator is ringing. It will run not far from 2,500 to 4,000 ohms at from 16 to 20 cycles per second, which is about the ordinary frequency for pole-changers and ringing machines. Removing the buzzer from the circuit will undoubtedly give better ringing effect, but in the case of a short circuit on one of the lines while ringing, there will be no protection to the generator. The buzzer is usually placed on the board as much as anything for the convenience of the operator, so that she can tell when ringing on open lines. The resistance of an electric incandescent lamp is not far from 200 ohms for a 110-volt, 16-candle-power lamp. This is non-inductive and will fall on the passage of ringing current, as heat lowers the resistance of carbon. The use of lamps is better than buzzers, for you will get better ringing results, although not affording as good protection to the generator. Better than all are the special ringing relays which are now to be obtained from telephone manufacturers. These relays offer very little resistance to ringing current as long as it is normal, but when it becomes abnormally strong, as caused by ringing on a short-circuited line, the relay pulls up and inserts a high resistance which prevents all damage.

Editor SOUND WAVES: I beg to offer two suggestions with reference to your article on the Ayrton shunt on page 47 of your June, 1907, issue.

The first point is a typographical error in the last two equations. The next to the last equation should have 10,000 as a denominator, and the last equation should have 1,000 as denominator instead of 10,000.

The second point is the statement, "It is really an accurate shunt and will give exact results when used as designed." This remark is not accompanied by any specific instructions for taking the constant of the galvanometer when using the Ayrton shunt, so that the remark quoted, standing alone, leads to the belief that a constant taken for one ratio is accurate and "will give good results" when used with a different ratio, since the object of the shunt is to change the ratios of the galvanometer readings. The error in the readings of a galvanometer with the Ayrton shunt is based upon the following:

The galvanometer deflection bears a fixed relation to the current in the main circuit; the current in the main circuit is the quotient of the electromotive force divided by the resistance; the Ayrton shunt in changing from ratio to ratio changes the current in the main circuit by changing the total resistance in the main circuit, the galvanometer then reading the changed current value instead of the original current value. To illustrate, the change in resistance in the main circuit which causes the change in current, Figure 4 of your article, may be referred to. In the position there shown the resistance of the galvanometer and shunt in the main circuit is

$$\frac{100 \times 10{,}000}{100 \div 10{,}000} \text{ or about 99 ohms.}$$

With the bridging brush on the 1/10 point, the resistance of the galvanometer with shunt in the main circuit is

$$\frac{9100 \times 1000}{9100 \div 1000} \text{ or about 901 ohms.}$$

When the resistances measured are high, as in measuring insulation in megohms, the mathematical error of the Ayrton shunt usually falls within the personal error of the observer, but the readings of the galvanometer used with the Ayrton shunt are mathematically correct only when interpreted as current readings and only when the constant of the galvanometer is taken with the ratio which is used in the reading.

The corrections as to typographical errors to which the correspondent refers are correctly made. The first denominator should have been "10,000" instead of "1,000" and the other correction the reverse. It is to be regretted that errors of this nature will creep into printed work.

The second point is not well taken. In the paragraph beginning "Figure 4 gives the circuit" there are clear indications of how the shunt is intended to be used. Quoting from this paragraph, "If we place the slider on the contact marked 1, and pass a current through the combination we will get a certain deflection. If we now place the slider on the 1-10 contact, the same current as before will give us exactly one-tenth as large a deflection." It was thought that this would clearly show the mode of procedure, namely, first taking the constant on the 1 point, then using the combination on the most suitable setting according to the strength of current to be measured. When used in this way it is absolutely accurate as a shunt, for the current which passes through will be correctly indicated. Nothing was said or called for with regard to the rest of the circuit. The only point at issue was the measurement of current actually passing through the galvanometer and shunt. All meas-

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uring instruments introduce some error into the circuits to which they are applied. Even a Weston D. C. voltmeter theoretically changes the voltage of the circuit to which it is attached and so does not measure the voltage which existed before it was attached. All ammeters also theoretically disturb the flow of current by their insertion, as they possess some resistance. The question of whether this disturbance is small enough to be neglected is one which enters into all measuring instruments, and did not seem to be called for by the questioner in the June number of this paper. No matter what shunt is used, the user must decide the question for the case at hand. Galvanometers are current measurers, and in their use this fact must never be forgotten. It was in this light that the Ayrton shunt was discussed, and we think it is the right standpoint.

It will be interesting to notice the variation of the joint resistance of the galvanometer and shunt at the different settings of the slider.

Let G = resistance of galvanometer,
S = resistance of shunt in main circuit,
r = total resistance of shunt box,
p = position of slider, from zero to unity,
R = joint resistance of combined apparatus.

Then $S = rp$ and

$$R = \frac{rp\ (G \div r - rp)}{rp \div G \div r - rp} = \frac{Grp \div r^2p - r^2p^2}{G \div r}$$

so that $R = \frac{1}{G \div r}[Grp \div r^2\ (p - p^2)]$

Differentiating with respect to p as an independent variable,

$$\frac{dR}{dp} = \frac{1}{G \div r}[Gr \div r^2\ (1 - 2p)]$$

Placing this expression equal to zero and solving for p will give us the point at which the maximum resistance is found:

$$Gr \div r^2\ (1 - 2p) = 0$$
$$r^2 - 2r^2p = -Gr$$
$$p = \frac{G}{2r} \div \frac{1}{2} = \frac{1}{2}\left(\frac{G}{r} \div 1\right)$$

Expressed in words, the point of highest resistance of the outfit is found by taking half of one more than the ratio of the galvanometer and shunt box resistances. Divide the resistance of the galvanometer by the resistance of the shunt box, add 1, and divide the result by 2.

In the case assumed the galvanometer was 100 ohms, and the total resistance of the shunt box 10,000 ohms. Putting these values in the equation, we get .505 as the setting of the slider for maximum joint resistance. Being between two contact points, the maximum will not be realized. This is a good thing, for if the slider could be set on the .505 point, the joint resistance would be 2,525 ohms. As it is, the highest point is the 1-10 contact, at which the resistance is, as before stated, about 909 ohms. Different galvanometers will give different points of maximum resistance. Inspection of the equation

$$p = \frac{1}{2}\left(\frac{}{r} \div 1\right)$$

shows that the point of maximum resistance depends solely on the ratio between the resistances of galvanometer and shunt box. Being a straight line function with a slope of 45 degrees, the larger the galvanometer resistance the nearer will be the point of maximum to the 1-1 point and the larger will be the value of that maximum.

Editor SOUND WAVES: What is the correct use of the term "private line"? Is it correct to call a line from central which has only one subscriber on it a private line?

There is some laxity in the use of several terms in connection with the telephone business. Among them are the terms "private line" and "individual line." Strictly speaking, a private line is one which does not terminate in any public exchange office for regular use. "Private" should be applied to all telephone lines and apparatus which are used solely between certain points under the control and for the exclusive use of a certain interest. Thus, if a manufacturer installs a telephone switchboard in his factory and runs lines to all parts of it, but with no connection to the public central office in the city, it would be called a "private exchange." When he has a trunk connection put in from his private board to the public exchange, his outfit becomes a "private branch exchange." This is because it becomes a branch of the public exchange. Or suppose a grain dealer has a business office and an elevator in one town, and an office or an office and another elevator in a neighboring town. If he has a telephone line put up connecting the two offices or elevators, without any regular connection to any public exchange, it will be a "private line." The number of stations on it will not affect its name in this regard. He may own the whole line and instruments, or he may rent them from a telephone company which is operating in one of the two towns. In the latter case the telephone company may run the private line through their central office and have test jacks on their main distributing frame so that when trouble occurs they can easily test to see which part of the line needs attention. It is still a private line, for in the central office it has no line signal or means of calling an operator, and no attention will be paid to the line by the employes unless the line gets into trouble or requires changes.

"Individual line" is the proper word to apply to a public exchange line which has only one subscriber on it.

Editor SOUND WAVES: What is the way to prevent cable from sagging between the hangers? When we put up our cable two years ago it was straight and looked neat. The hangers were put about two feet apart and were the common marlin hangers. Is there any way to keep the cable tight if we pull the slack out of it?

While the sagging of cable between the hangers is not a trouble which is likely to bring any damage to it, yet it gives the work an unsightly and unworkmanlike appearance. Every man with any ambition likes to give

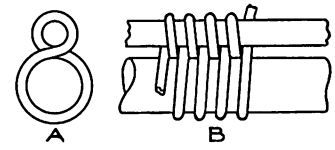

Figure 5.

his work that finish of neatness which is the mark of a good engineer. The best method with which I am acquainted is lashing the cable to the messenger with marlin in a figure eight. Figure 5, *A* and *B*, show the manner of applying it. *A* shows an end view of the cable and messenger. *B* shows the side view of the same. The marlin must be tied firmly to the messenger and the various turns about the cable and messenger put on as tightly as possible and very close together. The completed lashing should cover about six inches in length, surely not less than four inches. The lashing should be done while the tension is still on the cable. If you have

a long run of cable, lash it at several points, especially on each side of every Y-branch. If the spans are too long and the hangers spaced too far apart, it is difficult to keep a cable looking neat. Spacing the hangers a little more closely together will add very much to the good appearance and durability of a cable line, and costs very little.

Editor SOUND WAVES: How is the Kellogg desk telephone wired for central energy so that it has only two wires in the cord leading to the stand? In Miller's "American Telephone Practice" the circuit of the regular wall telephone is given, and from that I do not see how you can work it for a desk set with so few conductors.

In Figure 6 will be found the circuit for which the correspondent asks. It will be noted that it is not exactly the same arrangement as the standard wall set in that two condensers are employed and the hook has but one contact. As far as talking is concerned, this desk set arrangement is like the wall telephone. Both the

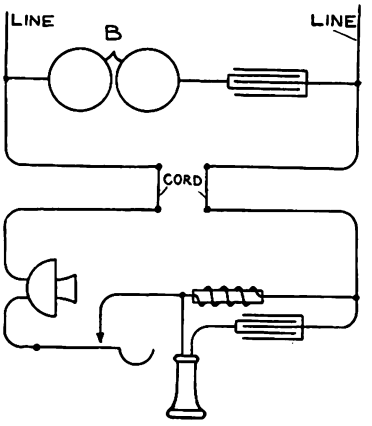

Figure 6.

retardation coil and the condenser are made small enough to go in the base of the stand. By having only one contact in the hook, the feature of clickless operation is lost, though many consider it worth losing for the sake of the simplicity of one contact. The small size of the condenser lowers its insulation, as the dielectric is thinner, but there seems to be plenty of margin left.

Editor SOUND WAVES: Are pocket voltmeters reliable for testing dry battery? I have heard the statement by some men that voltage is not a satisfactory test for dry cells and yet there are many pocket voltmeters advertised as especially adapted for battery testing. Please answer in your paper.

The statement which you have heard that voltage is not a satisfactory test for dry cells is very true, but that does not prove that the cheap pocket voltmeters, so called, are not good for battery testing. In many cases the indications of the pocket voltmeters are not volts, although they are marked as such. By test it has been found that often they are exceedingly in error. But that is not all. A true voltmeter is an instrument which possesses very high resistance so that it will not *appreciably* affect the voltage of the circuit to which it may be attached. Nothing which has a resistance less than 20 ohms per volt should be classed as a voltmeter. This makes a 5-volt scale require a 100-ohm movement; 100 ohms per volt is far better, which makes a 5-volt scale equal to 500 ohms. But most of the battery testing pocket voltmeters have a resistance as low as 10 or 20 ohms. Even if they were correctly calibrated, they cannot indicate correctly the voltage of the battery, as they pull so much current that they partly polarize it. But for testing purposes, in every day work, the voltage is immaterial. What we want to know is its ability to furnish current. To do this it is necessary to use an instrument with low enough resistance to pull appreciable current. This the pocket voltmeter does. So, though its readings are not true volts, and you cannot compare the readings of one with the readings of another, they are valuable if used comparatively. Try a few new cells with it, then try some old ones which you know have just passed out of service, and record or remember the figures. Then keep the same voltmeter for your own use and you will have a pretty good test for practical use.

Editor SOUND WAVES: Can you give a good method for determining the sizes of cables to be used on a new telephone system? We have the routes all planned, as we are figuring on using the old routes of the old plant. We will discard all the old material such as cables, cable boxes, etc., and build it all new. We will use no party lines. Please answer through SOUND WAVES.

The first thing to do is to get the distribution of your subscribers. This is best done by plotting them on a map from the data of your old directory, supplemented by the new contracts brought in by your solicitors. A good way is to place small figures in each city block or square, indicating the present number of subscribers. Then you will need an estimate of the probable future growth in each section of the city. This can be obtained only by personal inspection of the ground. Notice how nearly each block is filled with telephones, in connection with its possibility for holding population. If it is a block near the edge of town, where the houses are built on the cottage idea and all have more or less generous yards, you cannot count on more than one telephone per house. Near the center of the city, where the buildings are taller and there are many offices, the ultimate growth in telephones will be very much larger. Even if at a certain point there is at present only a three-story business building, it may later be extended to or replaced by a building very much taller, thereby extending its telephone possibilities. All factors like this must be taken into account. Find out from the real estate men and older inhabitants which direction the town is growing or is likely to grow. Also use your own head by noticing the

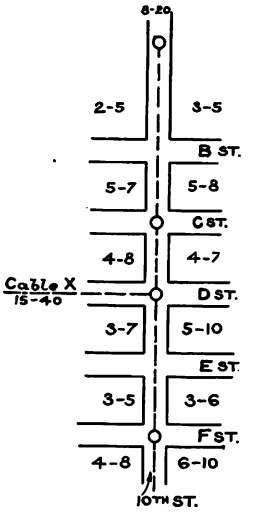

Figure 7.

geographical locations of the various parts of the city and their physical limitations and possibilities. In taking the testimony of the real estate dealers, be sure to allow quite a margin for the personal interest of the man in the lots which he has for sale in a certain locality. It is natural for him to tell everybody that the town is all going that way.

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Enter in red ink on the map the ultimate number of telephones in each block, according to your estimate. Suppose a certain block has at present eight telephones and you estimate an ultimate addition of seven more, making the total fifteen in the distant future. Your entry on the map would then be 8-15, the latter number being in red ink. In Figure 7 I have assumed a simple case on an imaginary street and assigned the present and future number of subscribers. These numbers are intended to show all the subscribers who will be fed from this Tenth Street cable on either side. We will first locate the terminal boxes. As regards the end of the cable there is no question. At the corner of B and Tenth we shall hardly need a can, as the subscribers above B Street will go into the last box and those below B Street will go into a box at the corner of C and Tenth. Accordingly we will locate one at the last named point. On D Street we find a branch cable coming in, for which we must provide pairs as well as for local distribution. This fixes a terminal box at that corner. In this manner we will work back to the central office, locating boxes according to the density of telephones.

After locating all the boxes, we must return to the end of the cable and begin to build up the numbers of pairs in it at each point of the route. Beyond the end of the cable there are at present eight telephones, with 20 expected. In the block below there are five at present and an ultimate of ten expected. We can easily supply them from the terminal box and avoid placing a can at B Street. Now rule off a large sheet of paper in the manner shown in Figure 8. Each vertical space indicates five pairs in the cable, the horizontal spaces being used

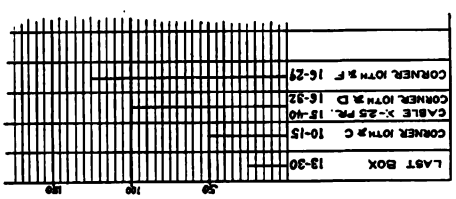

Figure 8.

for the terminal boxes, known by the street corners at which they are placed. The totals for the last box are 13-30, which we will enter on the sheet just to the left of the spaces for pairs. At this point we must consider the financial condition of the company and their desires in the matter. If they have the money and wish to put in at the present time enough cable to take care of the city for an unlimited time, you can look at the ultimate, 30, and call for a 50 pair cable. But if, as is the case with most companies, they wish to take care of the growth for a shorter time, you will call for only 25 pairs at this point. This is best indicated by drawing a line horizontally to cover the required number of pairs. Coming to the C street box we find the numbers 10-15. The totals up to this point are 23-45. Considering the present alone we could get along with 25 pairs, but 23 is too near 25 for safety. So we shall call for a 50-pair cable. This should be put in as a Y-branch with 25 pairs cut straight through and the other 25 legged out to the can.

At D street we have the branch cable to deal with. Treat it as a separate cable and develop it from its end till you find how many pairs it will need. I have assumed 15-40, on the basis of which we will make it a 25-pair cable. We can distribute locally in four directions, making it 16-32. Adding up all these numbers we have 54-117 as totals for the main cable at this point. As this is a junction point it is very essential that we have plenty of pairs, so we may well provide a 100-pair cable. This makes 50 to go straight through, 25 for the branch cable, and 25 for local distribution.

At F street we go through a similar process and arrive at 70-146, from which we are led to call for 125 pairs. In this way the cable is built up clear back to the central office. It will be well not to have all the boxes taken off through Y-branches, but to loop all the pairs through certain boxes to serve as testing points.

The foregoing is intended to show merely the method, it being impossible to illustrate all the details. For instance, no account has been taken of the advantage of supplying subscribers in the same block from different boxes because they are nearer. Yet this must figure in for reasons of economy. Other points will suggest themselves as the work progresses.

Editor SOUND WAVES: Will you please tell me whether we should get cross-talk over a metallic circuit paralleling a grounded circuit, both lines on the same poles and the metallic line transposed every half mile?

If the metallic circuit is in the proper condition, there will be no cross-talk from adjacent ground return lines. If cross-talk exists, it is a sign that something is wrong. There may be lower insulation on one side of the metallic than on the other side, a high resistance or loose joint, or it may cause cross-talk on the metallic if the latter is connected through the switchboard to a grounded line or another metallic which is unbalanced. But the metallic line must be free from cross-talk under normal conditions.

Editor SOUND WAVES: Some telephone companies use the single pole, single throw switch as a cut-off at all rural stations on grounded lines. Do you consider this safe? Does it not interfere with service on account of the contacts becoming rusty? Do you think lightning will refuse to come in on such a line? If the whole system were thus equipped, what would become of the lightning, there being no ground on the line at any station, except perhaps at central? One of our subscribers used one of these in his residence. He says that during electric storms it pops like a gun. What made the pop? Which is safer from lightning, a telephone with a good, efficient ground, or one with a poor ground?

The interference caused by the rusting of contacts on the switch mentioned should never occur. It must be a poor kind of switch. If a good brass or copper knife switch of some standard make is used, there will be absolutely no trouble of this kind. Get the kind used for electric lights, 15 ampere size.

If the whole line were equipped with switches, and all are opened in the storm, the central office will be the point of relief, since it is usually provided with carbon block arresters. If there are no carbon block arresters on the entire line, the lighter induced charges may not find any escape to earth. It is very rare that a telephone line is struck directly from a cloud, it being in the majority of cases an induced charge that gives telephone men trouble. If this induced charge is strong enough, it may break through the insulation at some point and go to earth.

If the subscriber who gets the "pop like a gun" has nothing but a switch and has that open in the storm, it is quite sure that the lightning is discharging at some point and making the noise. If the line wire comes into the house through the same hole as the ground wire, which is nearly always the case, the lightning is most likely jumping across from one wire to the other in the hole. Since the distance between the two wires is far greater than it would be in a carbon block arrester, the noise caused by the lightning jumping across will be greater.

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A telephone with a good ground on its lightning ar-

rester is undoubtedly safer than one with a poor ground. I wish to add a word or two about protection as brought out by the correspondent. Fuses and switches for lightning protection at farmers' houses on rural lines are an endless source of trouble and not worth their cost. The carbon block, open space arrester, properly adjusted as to space between the blocks and a sufficient area, is, as far as I know, the best thing to use. If fuses must be used as a protection against power current, as in the eastern and middle states, let them be large enough not to blow from lightning. Three amperes is a good size. But for general use, the carbon block cannot be beaten.

Recent Telephone Patents

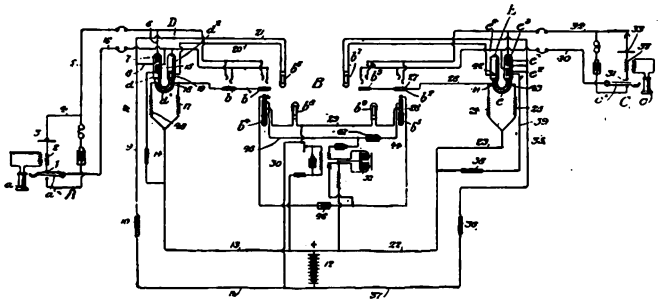
By David S. Hulfish

856,260. Telephone Set. Wm. Kaisling, assignor to Stromberg-Carlson Tel. Mfg. Co. Filed April, 1903. A specific arrangement of details of apparatus in a wall set.

856,386. Automatic Calling Device. W. O. Beck, assignor to Western Electric Co. Filed June, 1906. A counting controller for selection in an automatic exchange, or on a step-by-step party line.

856,488. Bracket. Charles L. Peirce, assignor to Peirce Specialty Co., Chicago. Filed January, 1906. A detail of the coiled-spring type of insulator bracket.

856,570. Telephone System. F. B. Cook and J. G. Nolen, Chicago. Filed February, 1903. The line relay of a common



856,570.

battery system is replaced by a heating capsule with conducting circuit-closing fluid moved by expansion of heated air within the capsule. (See cut.)

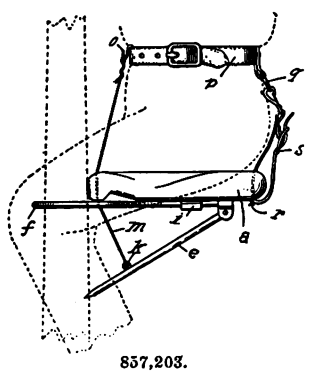
856,801. Bracket. Charles L. Peirce, assignor to Peirce Specialty Co., Chicago. Filed January, 1906. A metal insulator bracket having threads of formed sheet metal.

856,955. Jack. Harry P. Hibbard, assignor to Peirce Electric Co. Filed October, 1905. A sheet metal frame for mounting jack parts for strip-mounted jacks.

857,079. Multiplex Telephony. Maurice Leblanc, assignor to Westinghouse Electric & Mfg. Co. Filed February, 1903. The method consists of modifying single-phase alternating current whose frequency is high compared with the pitch of sound, and sending it through a telephone receiver excited by an alternating current of the same frequency.

857,101. Cross-arm for Tower. LaVerne W. Noyes, Chicago. Filed July, 1906. A cross-arm particularly adapted for towers and truss poles.

857,203. Lineman's Grab Seat. Clayton Randall, Mabel,

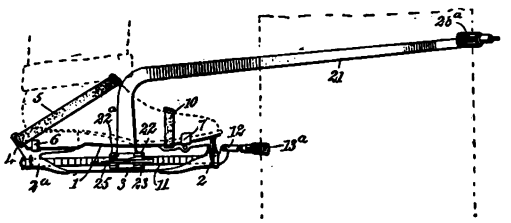


857,203.

Minnesota. Filed February, 1907. The illustration is explanatory. (See cut.)

857,430. Climbing Shoe. C. F. Youngquist and C. G. Youngquist, San Francisco, California. Filed June, 1906. The construction and manner of use may be understood from the cut. (See cut.)

857,480. Telephone System. Louis B. Nieman, Staplehurst, Nebraska. Filed March, 1907. A clearing circuit for cord



857,430.

pairs used in switching lines which talk metallic but ring central over a grounded circuit.

857,530. Wireless Telephone. Francis J. McCarty, assignor to McCarty Wireless Telephone Co., San Francisco, California. Filed February, 1906. A microphone button and a make-and-break contact are simultaneously controlled by the speaker's voice, both circuits energizing the same induction-coil core.

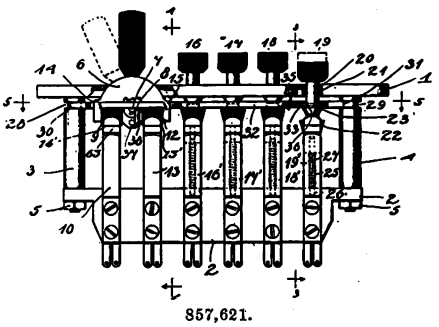
857,621. Key. A. M. Haubrich, assignor to Stromberg-Carlson Tel. Mfg. Co. Filed September, 1904. Combined listening and selective ringing key. (See cut.)

857,622. Attachment. Guy C. Odor, Lima, Ohio. Filed May, 1906. A circular card directory surrounding the transmitter mouthpiece.

857,751. Land Anchor. F. R. Parker, assignor to Frank B. Cook, Chicago. Filed October, 1906. The anchor carries spiral blades which are expanded after being bored into the earth. (See cut.)

857,959. Automatic Exchange. N. E. Norstrom, Junction City, Kansas. Filed May, 1900. In an automatic exchange, selecting currents are sent from an alternating current hand generator, the impulses being governed by a dial or index device.

857,966. Automatic Switch. Charles M. Thompson, assignor to Charles M. Thompson Co., Chicago. Filed January,



857,621.

1907. A connector of the Strowger type.

858,363. Telephone System. Clarence A. Anderson, Lindsborg, Kansas. Filed May, 1903. A step-by-step party-line system.

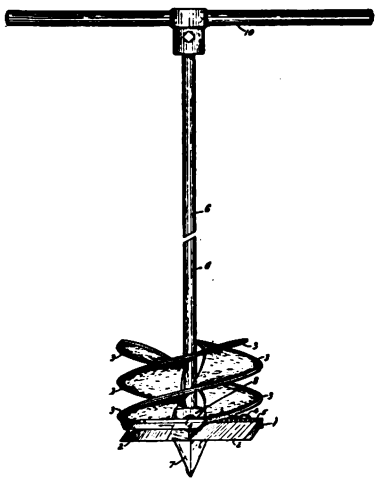
858,454. Telephone System. Adwin B. Heaford, Omaha, Nebraska. Filed December, 1906. A two-way common battery multiple system, with two-way cord pair.

858,637. Attachment. Wm. H. Stinson, DeFuniak Springs, Florida. Filed March, 1905. A device operated by the ringing of the telephone bell to indicate mechanically that the bell has been rung.

858,739. Combined Instrument. Frederick W. Medhurst, Hobart, Tasmania, Australia. Filed March, 1907. A specific arrangement of parts in a combined telegraph and telephone set, with tuned reed for calling.

858,767. Party-Line System. Julius M. Storkerson, La Crosse, Wisconsin. Filed April, 1906. The twisted jack system is combined with harmonic or other selecting system to increase the selective stations per line. (See cut.)

858,775. Telephone System. Clarence E. Ackerman, Vernon Township, Shiawassee county, Michigan. Filed September, 1905. A system of night service to special lines on a switch-



857,751.

board where an operator is not in attendance at all times. (See cut.)

858,819-822. Support. Wm. B. Oliver, assignor to Oliver Mfg. Co., Philadelphia. Filed 1906. Holders for desk stands and desk mountings for telephone sets.

838,836. Attachment. Burton W. Sweet, assignor to Century Telephone Construction Co., Buffalo, N. Y. Filed September, 1906. Means for attaching a telephone set to a swinging arm.

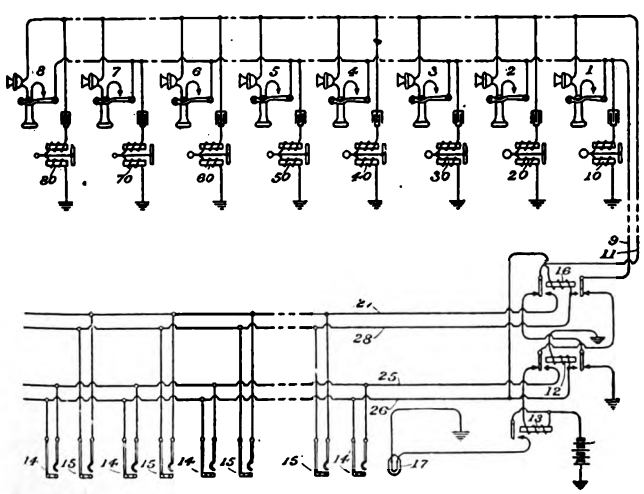
858,944. Attachment. Henry S. Bepler, Allegheny, Penna. Filed September, 1906. An attachment for holding the receiver when in use.

858,984. Transmitter. N. H. Holland and G. W. Kauser, assignors to Ernest H. Stolz, Chicago. Filed July, 1906. The novelty over the general art lies in the method of holding the carbon granules.

859,201. Telephone System. H. P. Clausen, assignor to American Electric Tel. Co., Chicago. Filed July, 1903. An automatic ringing circuit for local battery systems.

859,221. Attachment. Stephen C. Houghton, Rome, N. Y. Filed July, 1906. A detail in device for holding desk telephone set.

859,276. Switchboard. Frank W. Wood, Newport News,



858,767.

Va. Filed July, 1906. A cordless switchboard of compact water-proof type.

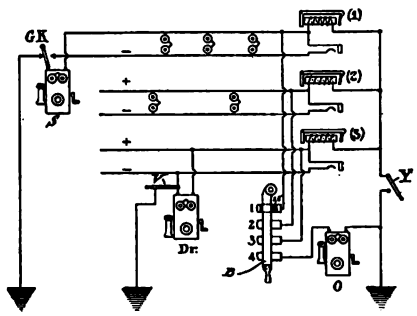
859,464. Damper. August Schaffer, East Columbus, Ohio. Filed December, 1906. A damper, or anti-buzzing device, for receiver diaphragms.

859,479. Attachment. George L. Blackburn, Greensboro, N. C. Filed March, 1907. A bottom guard for the receiver of a desk stand. (See cut.)

859,534. Selective System. W. D. Watkins, assignor to Watkins Manufacturing Co., San Jose, California. Filed April, 1906. A step-by-step party-line system.

859,549. Coin Device. W. W. Dean, assignor to Western Electric Co. Filed January, 1902. A blocking device prevents communication with the called subscriber until after a coin has been deposited.

859,556. Test Device. Herbert M. Friendly, Portland, Oregon. Filed April, 1905. A self-calculating method for making Varley tests.



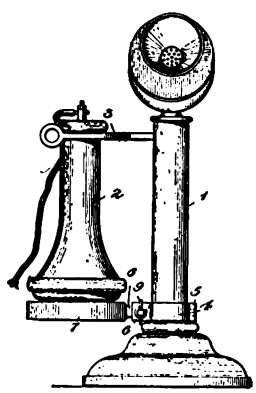
858,775.

859,676. Relay. Ray H. Manson, assignor to Dean Electric Co., Elyria, Ohio. Filed September, 1905. The Dean relay of the return-pole-piece type.

859,702. Attachment. Louis Steinberger, New York, N. Y. Filed February, 1905. A directory card surrounds the desk stand below the lower end of the receiver.

859,774. Telephone System. J. W. Lattig and C. L. Goodrum, assignors to Dean Electric Co., Elyria, Ohio. Filed June, 1903. A two-wire multiple system, with two-way cord pair, and using polarized line relays.

859,775. Coin Device. J. W. Lattig and C. L. Goodrum, assignors to Dean Electric Co., Elyria, Ohio. Filed November, 1903. An audible-signal coin-collecting telephone set.



859,479.

859,827. Attachment. Charles H. Molyneux and Max Braunstein, Rochester, N. Y. Filed September, 1906. A device for holding a sheet of antiseptic material over the mouthpiece, and for renewing it.

859,884. Telephone System. Uriah S. Jackson, assignor to Superior Automatic Telephone Co., Boston, Mass. Filed August, 1905. A step-by-step party-line system with line control by each station.

Out in California the telephone and telegraph poles are painted green, and the people like it. This is especially true of the lower part of the state where green is the prevailing color all the year around. The scheme originated in the Yosemite Valley, where all transmission poles are painted green. Here is an opportunity to standardize something, providing it is done before some one corners green paint.

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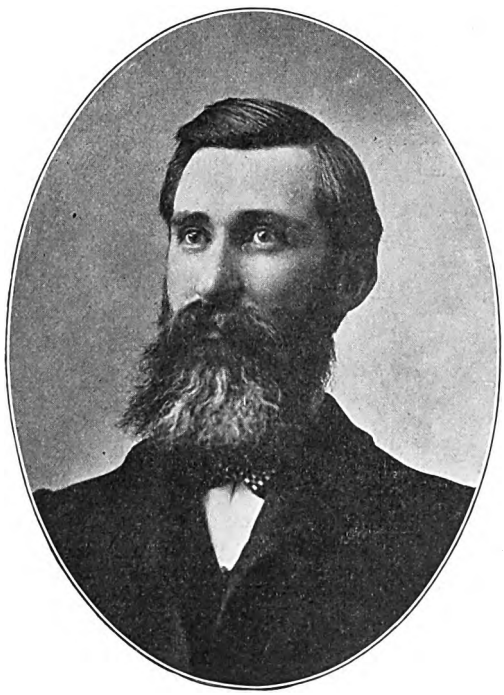
Current Convention Papers*

CONDITIONS IN WEST VIRGINIA.

INVENTION of any public utility is a great event in the life of the people. We have witnessed the invention of the steam engine, its application to navigation and railroads, and have seen its marvelous growth. The telegraph also has welded the world into one nation as far as communication is concerned, but it remained for the telephone to transmit the human voice and bring distant cities and towns in closer touch. The rapidity of growth of these different inventions has been very great, but in comparison the telephone has outstripped them all.

The business of telephony is yet in its infancy. It has passed from the category of being a luxury to that of being a necessity in business and the home. It probably touches the people more closely than any other public utility. Its growth has been marvelous. The telephone was first used in 1876, and from that time on exclusively by the Bell until 1894, when the patents expired and the increase from this period—1894—to the present time has attained the remarkable record of something like 2,000 per cent.

There are some 500,000 stockholders in the Independent telephone companies, and they outnumber the Bell in the United States three to one. This, notwithstanding the fact that the Independent telephone companies have not been able to establish centrals in many large cities such as New York, Chicago, Cincinnati and Washington. The following article from the *Electrical World*, will be illustrative of the progress we are making:



J. Walter Barnes.

"One of the significantly large developments in the electrical field in 1905 was that witnessed in telephony. The growth there was probably greater by far than in any other branch of electrical application. It might have seemed that the violent outburst of activity noted four or five years ago would have worn itself out or at least quieted down to sober advance, but the activity is so steadily maintained at a high rate it would appear to be normal rather than abnormal. At least there is every sign that the industry is far from the point of saturation, and he would be a bold man who would predict just what that point is likely to be.

"We know no good reason why 30 per cent should not be applied as the rate of telephone growth all over the country, but it is certainly conservative to take 20 per cent and even 25 per cent might be safe. Dealing with the telephone industry as it was in 1902, it will be seen that some very striking figures emerge as to the conditions at the end of 1905. With 2,315,297 telephone stations in 1902 a steady gain of but 20 per cent gives over 4,000,000 at the end of 1905. The investment or capitalization was $348,031,058, and would now be $600,000,000. The gross income in 1902 was $86,825,536 and it would now be not less than $150,000,000. To some persons it may be incredible, but the fact is that the telephone business has now surpassed in profit and productiveness the central station industry. That its pace will slow down somewhat, presently, like that of the lightning business, is highly probable, but, as we have said, there is absolutely no indication of any immediate intention on its part to do so."

The progress that is being made in which the whole country will soon be united warrants the prediction that in the near future there will be another telephone company thoroughly united and harmonized that will compete with the Bell and maintain a lower rate for service than obtains under the monopoly. Today people are receiving service at a rate so as to maintain two telephones where before the advent of Independent telephony they were unable to secure one, the rate being prohibitory.

The development in West Virginia, while it is not remarkable in some sections, in others has had a very rapid growth. There are some eight or ten strong companies in the state that have a very large volume of business, and these with their allied small companies are doing much to cripple the Bell monopoly until it is forced to give free telephones for a certain period, giving a free residence telephone with a business telephone, and the lowering of rates in certain sections, lower than business can be done for, and in other and various ways to put the Independent telephones out of business. The public cannot be so easily deceived; they know that had it not been for the Independent movement they would be practically without telephone service because of prohibitory rates. The first use probably of an Independent telephone was in 1892 at Clarksburg, when Moore Jackson, C. L. Hickman, Dr. Morgan and others purchased some telephones and started a small switchboard exchange, the line running from Clarksburg toward Weston. Suit was entered by the Bell company and these telephones confiscated and burned by order of the court in the public square. But it was a conflagration that served only to stir the hearts of these people the more, and in 1893 the Clarksburg Telephone Company was organized and the fight renewed. The exchange became a fixed fact and success, and out of it has grown as the parent company the Consolidated Telephone Company, embracing allied companies in several counties. The larger company was organized in 1901. Thus we see that the Consolidated, or its forerunner, the Clarksburg Telephone Company, was the first organized in the state.

I have not the data to trace the growth of the various companies throughout the state. Suffice it is to say that the growth has been vigorous, and there is a tendency among them to unite into a common whole. The total number of telephones of which we have report in the state is 14,599 as against 7,312 Bell telephones in the same territory. The number of toll stations, 309 against 131 Bell; number of exchanges, 50 against 24 Bell; total miles of pole lines, 2,014, with Bell not given; total number of miles of wire on telephone lines, 18,422. The gross earnings of the companies represented in the association aggregates $1,176,775. There are other companies not members of the association with connections with the members which brings the total number of telephones above 20,000 against 10,000 Bell.

This growth should rapidly increase because of the fact that the companies are all home institutions, while the Bell is controlled by Pittsburg capital in this state. The home merchant makes much of the fact that we should represent home merchants, manufacturers, and the like, and yet often when it comes to a question of using a telephone he will install a Bell telephone because it is a foreign corporation.

In July, 1896, there was organized the Central West Virginia Telephone Association for the mutual protection and advancement of all Independent telephone interests in West Virginia. This association had several meetings, but the records do not show how often these meetings were held, and I am not advised as to how long the association existed, but I found a constitution and some minutes that stated that the Central West Virginia Telephone Association met at Clarksburg on September 17th, 1901, and that Mr. Jno. Koblegard was president, and that at this meeting Mr. N. C. Henderson was elected president for the ensuing year. At a meeting at Fairmont in 1902 the association disbanded by reason of the fact that there was a disagreement over plans for hiring a man to look after and equalize the tolls between the companies. In May, 1902, a call was issued for a convention by Mr. A. C. Davis at Parkersburg,

*Secretaries of the various State associations are invited to send all papers bearing on the Independent telephone situation, no matter what the subject may be, direct to the publisher of this magazine. Co-operation of this kind will have a lasting benefit to the industry we are conscientiously endeavoring to serve.

asking all the Independent telephone companies in the state to meet for the purpose of organizing anew the West Virginia Telephone Association in order that the state might be represented in the International Independent Telephone Association in June, 1905. What was done at this meeting the minutes of the secretary will show.

A perfect state organization of the telephone interests is almost impossible so long as the companies are so scattered and dependent on their resources for support, because of the limited number of lines in the state to furnish an interchange of business. The object of this association, as we see it, is to form such a union as will more firmly cement the Independent interests, to promote uniformity of operation, construction and equipment, and to defend by co-operation the different companies, and to give all moral and legal support in any aggressive movement against the common enemy; to procure the enactment of such legislation as will be to our best interests; to interest home capital and home people in our enterprises; to devise ways and means to protect the companies against the attacks of the opposition, and to aid by judicious advertisements and maps as may be for our best interests.

The great needs of the Independent telephone companies in this state today are, as I take it: First, a traffic association of some character, in order that an equitable division of tolls can be made between the companies for long distance business. Whether or not the different companies should join the Western Traffic Association, or whether we should adopt Mr. Handlan's suggestion of pooling all toll-lines on the basis of cost is to be determined. Second, the settlement of all disputes should be according to the rule recommended by the board of directors of the International Telephone Association, that is, by arbitration. The president would state that the executive committee has in a manner divided the state into districts, so that one member of the executive committee of the association is assigned to each district, and that all matters and disputes should be filed with him, and he then should call in two members of the executive committee from other districts to act with him. Third, the proper dealing with rural lines or mutual telephone companies which is probably the most important question to come before the association and which is to be fully discussed in papers before this assembly by gentlemen fully competent and prepared to give pertinent recommendations. Fourth, we should have a committee on legislation and a committee on traffic. Fifth, there should be a map showing all toll lines of the different companies with their connections. This matter is of great importance and should be placed in the hands of a committee.

In brief I have attempted to sum up the situation, and there is everything to encourage us to go forward to meet the competition that we have that is not of the fair, open sort which we like, but is covert and underhanded, even posing under the name of Independent companies in order that it may answer its ends. —*Abstract of an address by J. Walter Barnes before the annual convention of the West Virginia Independent Telephone Association.*

EXCHANGE OPERATING.

THE foundation of my subject is the chief operator and her assistants. If the contract for building a house were submitted to a poor contractor, the house would be poorly built from foundation up. In time, the plumbing would give out, the roof would leak, and a thousand and one little annoyances would follow one upon the other. You may patch here and may patch there, until finally you have only a patch upon a patch.

An incompetent, irresponsible, chief operator, divides her work among assistants equally incompetent and irresponsible. Should they be otherwise, they must do the work allotted to them according to her instruction, and not venture to assume any responsibility or encroach upon her authority. When she is chosen from their number for the position, she regards the rules of the operating room henceforth as a discarded primer for her. She is given charge of the operating department and represents the kind of young women employed. She is too self-centered to realize that the quality of her operators' work is based on the standard she has placed before them by her example. As a chief operator she regards herself as a privileged character. Rules, that as an operator she obeyed, she purposely ignores. They are enforced only where her subordinates are convened. She generally has her favorites, who fall from her favor when they least expect it, and she always has her enemies. When she has cause to censure any of her operators for a deficiency in service, she feels the unexpressed thought of scorn they have for her.

In time, discord, dissatisfaction, and discontent arise, three d's that stand for one little word "decay." Then the patching commences. As a last resort, a change is made in chief operators. With affairs in this state it is hard to select a suitable chief operator from the operating force. The favorites stand by the last chief operator and her enemies want the position themselves. Perhaps a timid, inoffensive, little thing is chosen, one who worked faithfully on during all the discord and who has nothing to say one way or another. She soon realizes that she has a force of very fine operators, but she also soon realizes that she is not able to handle the situation. The best machinery is useless without the power to run it.

A successful chief operator, is one who is highly respected in her community; she is a good disciplinarian, kind and considerate; able to control her temper under great provocation; courteous to her superiors and wins the same courtesy from her subordinates. She emphasizes each operator's good points. It makes them stronger, while if you harp on their weaknesses, it causes them to lose confidence, something which it is more important to possess in telephone work than in any other kind of employment. A good chief operator who finds any rules too rigid for herself has them crossed from the book and like a taster at a king's court she gives no food that she would be afraid to taste.

By the use of the monitor, a desk on which every call on each operator's position is reflected, the chief operator knows with what degree of speed, calls are answered. With the monitor buttons the supervision of each operator's work is complete, as the chief operator or assistant supervises their work by the use of these buttons every minute of the day. Thus, without our knowledge, no wrong phrases may be used, no

Miss T. Barnes.

talking to subscribers, no opening of keys, no rough handling of cords or any other irregularity that is bound to occur when a board is not supervised in this way. I believe when the supervision of operators is the only work allotted to the chief operator in offices where there are from 800 subscribers up, the result will be highly satisfactory. When I am on duty at the monitor, my assistant attends to the records, markings on the switchboard, etc., and when she is on duty at the monitor, I take care of the records. In this way we are both familiar with the chief operator's duties and should either of us be detained from the office the other can handle the work intelligently.

The selection of young women for operators is the first and most important step. Great care should be taken to know that they are of good character.

As I glance over the pages of my application book, I fancy I can see countless faces of every description; from the face of the bright young girl on the sunny side of youth to that of the diffident old maid just over the border.

The applicants, their manner of applying and the many phases of life introduced, are pictures that illustrate my little application book.

I am interviewed daily by applicants desiring positions. I classify these applications under different headings and keep memorandums for future references.

As I turn the pages the picture of "The Rolling Stone" frequently passes before my vision. She enters the room very often, chewing gum, walks up to the desk, which is near the door.

"Are you the chief operator?"

"Yes; I am the chief operator."

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"Well, I am looking for a job. Dou you need any more girls?"

"Where were you employed last?"

She shifts her gum to the other side of her mouth, while she lets her eyes roam restlessly around the room.

"At J. W. Gomes Company, but I don't like the work and the 'boss' wouldn't give me a raise, and so I quit him."

"How long were you employed there?"

"About two months."

"Where were you employed previous to that time?"

"Well, I've worked different places. I left school because I didn't want to be a teacher. I started to learn the millinery trade, but it was all work and no pay so I went to the other telephone company, but I couldn't get along with the chief operator. She was disagreeable, so I quit her. I thought I'd try this company now. I'd be willing to come right away only I don't want to work Sundays and evenings—what's the pay?"

The picture shifts and is replaced by the picture of the timid old maid, who is too young to be classed with the old people and too old to be classed with the young. She has been elbowed from place to place by the younger generation. She dreads the thought of folding her hands and growing old and useless. She does not realize that there are any short cuts, but she travels in the same rut always, because she started that way. She would be as steady as a clock, but a clock will still run when it is an hour slow. The fault of a slow running clock may be remedied, but there is no remedy for the slowness of the old maid who starts out to make a living after she has passed the last mile stone of youth.

The picture is followed by that of the widow asking to return to the work of her girlhood days. I wonder how she can pick up the thread again in the loom of business that she so gladly dropped amid a shower of blessings. I think of the bright pictures fancy must have woven for her before she laid down her office work to be married, and I wonder if dull care ever slips away, long enough to allow fancy to weave a brighter future. Again the picture changes to that of a young girl just fresh from school. Her bright face and thoughtless words tell me how little she realizes that she is on the dividing line of the land of irresponsibility and about to step over into the land of care; that when she has stepped over, she must take up the responsibilities of life henceforth.

This picture is succeeded by that of the cloudy face of the grumbler. She grumbles herself out of one position and tries to grumble her way into another. She is utterly without tact. I always feel that I would like to know if she could smile. As grumbling is a contagious disease (if we know it in time), we file away these applications for reference only.

But of all the pictures I love to look at, the picture of the girl with a sunny disposition is the one, no matter how plain or irregular her features are. Happiness is also contagious and thus, the girl with a sunny disposition is always in demand.

I usually employ young women between the ages of 18 and 25 years. Under 18 years the problem of making their own way in the world is a hard matter for them to grasp. Their work is uneven and I find it difficult to make them understand the importance of regular attendance. They accept the work as an experiment in the business world and before they have had time to learn it they have grown tired of it.

Young women over 25 years of age are very hard to train. Their moves are slow, diffident and uncertain. If experienced, it is even harder to impress them with more modern methods. They have become set in their ways and ideas. They do not seem to realize that as an exchange grows larger and spreads over greater territory, that the simpler methods of handling the concern in its infancy, were all right in their place and time, but they no longer fit the present conditions.

Good health is one of the necessary requirements of the applicant. On good health attendance depends and on attendance good work depends.

An operator is impressed with the importance of regular attendance from the time she is accepted as a student. When she becomes an operator she is assigned to a regular position at the switchboard and must, during certain designated hours each day, be at that position unless she is detained by sickness, in which case, she must send word in time to supply a substitute. An operator soon becomes familiar with the wants of her subscribers and is able to anticipate many of them. In the early hours of the day, she watches her chances for the busy grocer and butcher and the feminine portion of her subscribers are generally satisfied before the rush of business is on.

In case of sickness among any of her subscribers, she watches for the little lamp to light that is to be a herald of hope or sorrow to some one, and no one realizes the need of prompt efficient service at a time like this, more than does the operator. She has not been on a position very long until she knows just who her "crank" subscribers are; those who are cranky with everyone but her and those who no one can please. To allow no friction to mar the harmony of a day, it is her aim to keep these people satisfied to the best of her ability.

As an operator grows more attached to her subscribers, she is often unwilling to allow illness to keep her away from duty, thus leaving them to a substitute who is not familiar with many of their peculiarities.

To cause an operator to become interested in her work, is to give her something to be interested with. To assign her this position today and another tomorrow, and never allow her to be on any position long enough to center her interest or thought will cause her to merely work with her fingers while her thoughts stray out of the window. Sometimes she reports for duty tired because of loss of sleep. Her thoughts are chiefly of "how tired she is," "how glad she will be when 5 o'clock comes," "what a long day." The subscribers feel the lack of interest in her voice. They have no confidence in her response: "That line is busy; shall I call you?" Her voice trails into an indefinite nothingness on the last few words. The loss of confidence is soon followed by the loss of patience. Then there is a discord, a jar, a jangle. After the case has been summed up on both sides, the result is likely to be the loss of a subscriber, or operator, or both.

The importance of punctuality cannot be too strongly emphasized. It seems strange that as this has been a rule that we were taught from the first day of our school lives and step by step as we advanced from one grade to another, the importance of attendance has been dwelt upon, that we fail to consider it of any more importance in our dealings in the business world. I find this one of the weakest points of the beginner. After she has been in the service as a student for a few weeks, she realizes that her work in every particular must be satisfactory before we accept her as an operator. Her work as a student is like a sample of goods that we ask for at a dry goods store. We do not want the goods until we have proven that the sample is all right. From a strict observance of punctuality, operators are soon impressed with the fact that until they arrive there is a halt, as they must report for duty in the dressing rooms at five minutes before the hour. The chief operator gives three signals from her desk beginning at five minutes of the hour to operators in the dressing room. The first signal at five minutes of, is a warning bell; the second signal, three minutes of, means to form in line in order of position at the switchboard and the third signal at two minutes of, means to pass into operating room and stand at right of operator to be relieved. The chief operator then gives three more signals, the first for operators who are to be relieved to pull receiver plugs, step back and form in line to pass out; the second signal is to pass out and third signal for operators on duty to draw in chairs and be seated. If any operator is missing at the second signal in the dressing room, the line is held; if she comes running in at the last minute all out of breath and drops into place in line, she feels although not late, that it is a poor beginning for a day.

A young woman asks the question: "If I have a salaried position, am I expected to work overtime?"

Not ordinarily, but if you were to investigate, you will find that most of the people who have been promoted in office are those who have been willing to work overtime when necessary, and who have their employer's interests at heart. Generally it pays to be willing to work a little longer when the company is pushed for time. They can get plenty of people who will drop work when the whistle sounds, but it may not be so easy to obtain some one who will spend a few minutes extra. This time is usually appreciated in the end.

On the daily deportment card, the record of each operator is kept. A clear record is indicated by no checks. It is only the irregularity of service that is recorded. When the monthly card is placed on the bulletin board, there is great interest manifested among the operators as to their standing. Prizes are awarded every three months for the first four operators having the highest records. The deportment card embraces all of the rules of the operating department. Operators are as familiar with the rules as they are with their work. They obey them cheerfully for they soon realize that rules should be regarded as a fence of guides which show them the boundary lines of good service. I will also add for the benefit of the chief operator who thinks it necessary to nag and threaten to maintain a quiet, orderly operating room; when this fence of guides is barbed with a sharp spiteful nagging, the rules lose the significance for which they were designed and become as sentinels just ready to aim if not obeyed.

Although regular attendance and punctuality are the two most important features on the deportment card, there are many others that are very needful for good service.

Operators should be trained that there is only one way to put up and take down a connection. That is by taking the plug between the thumb and first finger, never allowing a plug

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to drop to the table. It is a simple lesson for a student who has no previous training in any office, but a difficult one for the operator of the old school who will grab all she can get, no matter how many cords are placed on the scrappy, scratchy tattered list, no matter how much woodwork is battered up; no matter how much endangered are her neighbor's eyes (she must dodge), no matter how many extra hours the trouble man puts in on Sunday and at night and finally, no matter how ungraceful she looks as she scrambles wildly to keep her balance in the chair in her effort to pull down a connection just beyond her aimless reach.

Correct cord handling is very closely watched and operators soon work noiselessly and acquire a speed that does not seem probable. Cases of disconnect are rare and are soon discovered and very often are rectified before the error is noticed by the subscriber.

Correct position is another important feature on the card. As each operator's work is directly in front of her, her eyes should be in that direction. There is nothing so annoying or embarrassing as to enter an operating room and see every head, as though working on a pivot, turned in your direction. When an operator is not busy the correct position for her is to fold her hands and watch supervisory signals and calling pilot.

The training of the voice to become soft, low and very distinct, is perhaps the most difficult training that an operator has to take. As a student, no matter how naturally soft a voice is in conversation, it becomes unnatural, discordant and unmanageable when speaking through the transmitter. This is due to nervousness. I never allow a student to speak to a subscriber until she has taken a great many lessons on her voice. When she is able to repeat the phrase lessons to me through the transmitter in a soft, sweet and distinct tone and is able to control her voice so well that a person standing back of her chair can hardly hear her, she is allowed to answer calls. I rarely find a student whose voice cannot be trained and it is just as uncommon to find one who considers her voice an asset as she pipes out her application on too high a key for the quietness which prevails in the room, or if she speaks in a subdued tone her voice has a muffled and indistinct sound, and she must repeat what she has said a time or two. In a switchroom where fifteen or sixteen operators are working during the busy hours of the day, when all hands are moving swiftly and noiselessly, taking down and putting up connections and still no sound of voice, or dropping of cords, the effect is very pleasing.

Each operator takes at least two or three phrase lessons a day. The phrases taught are the only ones an operator is allowed to use in her dealings with the subscriber. For any information that cannot be answered with these phrases, the subscriber is referred to the manager, chief operator, information operator or trouble operator, according to the nature of the request. If an operator uses any other phrases but the right ones, it is marked against her on the deportment card.

It is surprising what a barrier to any undue familiarity these phrases have on the part of the subscriber, or the operator. Much unnecessary conversation is prevented in regard to reports of trouble by the operator referring subscriber to trouble operator by simply saying: "I will give you the trouble operator," closing her key and trunking call without any further parley. An operator's time and attention should not be taken from her regular work of putting up and taking down connections. As sure as it is there is a congestion of business on her position. Three out of every five reports of slow service are caused by an operator testing a line or taking a report of trouble.

Other points that are strictly observed are, no communication between operators after they enter the room. No talking to subscribers and no opening of keys on conversation.

Courtesy to their employers, to each other, and to the patrons of the company are points which cannot be made too strong. An operator who lacks courtesy among those with whom she is daily associated, should not be truted in a switch room. I find that this rule is *not* strictly observed in other lines of work and many an applicant is turned away simply because of the flippant manner in which she speaks of her last employer, or her last teacher at school.

Waldo Pondray Warren says:

"Courtesy, kindness and thoughtfulness always have their reward. History is full of incidents which show upon what little things careers have turned. And where one such incident is known there are thousands that are unknown.

"A man is impressed by a lad's polished shoe and makes inquiries which lead to his employment and the boy becomes a captain of industry. A cheerful smile wins a friend who introduces us to a circle of helpful men and women, whose ideas raise our standards and influence our lives. Even the simplest little acts of courtesy and kindness have been known to open broad channels for good.

"The reverse is always true. A man lost a valuable business partnership because he made an unkind remark about another on the day the papers were to have been signed. We never know friendships and opportunities are closed to us because of unfavorable impressions made by the neglect of the little niceties of life.

"We travel a road that branches in many directions. One careless turning may affect our entire journey. Only by making sure that we are taking the right direction at every point can we hope to reach the best, that is possible to us. But if each purpose and act expresses the highest standards we know, any hour may become the gateway to a larger field of opportunities."

I have been asked the question, "How can you make your operators see the importance of these things as you see them and accept them with such cheerful willingness?" My reply is, "By having established rules and applying them daily." Spasmodic attempts at reform never achieve the same results as a systematic daily application of the rules, if they are good rules. These spasmodic attempts at reform always make me think of the spring house cleaning. So much trouble, turmoil, discomfort and soap suds, and before the last tack is in, the dust and dirt are creeping back again. House cleaning is not a preventive for dirt and dust and these spasmodic attempts at reform are not preventives for irregularities in service that are bound to occur again and again if passed over without a reminder.

The position of trouble operator is perhaps the hardest to fill in the office. It requires an operator with a temper which is most elastic and will bear any amount of stretching. The easiest man on earth to get along with, feels persecuted when his line gets in trouble. He usually has a vocabulary which he uses expressly and expressively in relating his trouble over the telephone to the trouble operator. If you think I am exaggerating, try being a trouble operator. At the end of the first week you will feel like Napoleon felt as he is portrayed by the small boy in his essay. "Napoleon fit and fit and was ready for more."

But the trouble operator does not get angry when a subscriber reports a line, using some very emphatic language to punctuate here and there with a word or two which were not in the last Sunday school lesson. She listens calmly and replies sweetly, "I'll report your trouble for you right away."

Among fifty girls and the changes that take place from year to year, I encounter a great variety of dispositions. I do not think there is any line of work where the true side of a person's disposition will show up as in telephone work. I believe there is no work in the world where the young woman of today must hold as close a rein on her temper, mode and desires.

The quick-tempered operator walks into our midst with a smiling face and bright "good morning." She has an elastic step and all of her movements are light and easy. She starts to hang up her coat on her hook—the hook she generally uses—but the hook is in use. The smile fades from her face and two red storm signals are hoisted on her cheeks. Her eyes emit sparks of fire. She takes the poor inoffensive coat from the hook like a terrier seizes a rat. "Whose coat is this?" she says as she gives it a vicious shake. "Oh! it is mine, dearie," says the girl with the sunny disposition. "Is that your hook? I am sorry." The sunny smile on her face is reflected on the cloudy face of the other. "That's all right," replies Miss Quick Temper and the clouds and every sign of storm are gone in a minute.

The stubborn operator enters the room resembling a wooden image more than anything else I can think of. Something has gone wrong at home and she has thought of nothing else all the way to the office. She might be deaf and dumb and blind for all the impression that the bright sunny sky and the deep rich tints of summer in all its glory make on her. She unbuttons her coat like a wooden soldier, hangs it up mechanically, goes over to her chair in the gloomiest corner and seats herself with her back to the others.

The selfish operator walks in next, looks for the best hook, hangs up her wrap, takes the easiest chair and looks around to see if she could have done better. Satisfying herself on this point, she stops a very interesting and jolly little story just before it has reached the laughing point to inquire who will work her Sunday. "I will," replies Miss Sunny Disposition, "if you will work the following Sunday for me." "Well, I can't work anybody's Sunday but my own, but I will make up the time by working an hour for you at a time on a weekday if you will let me know a day or two before," returns Miss Selfish, and strange to say Miss Selfish generally gets what she wants. Why? Because her selfishness has made her far-sighted and quick-witted. Before the other girl can make up her mind or figure ahead for herself, Miss Selfish has exacted a promise from her. It is the same way in the switch-room. Every rule should have a proviso to suit her particular case.

The over-sensitive comes walking into our midst carrying a chip on her shoulder. We very carefully step aside so that she may hang up her coat without our seeming to crowd her out and some one reaches out and puts it into place. "Oh! I suppose

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my hair looks terrible," she snaps. "Let it alone. I don't care if it isn't as smooth as yours." She is always expecting some one to say or do something that is a reflection upon her work. If attention is called to any particular rule that has been disregarded, she takes it as a personal censure. She keeps her associates busy, explaining to her that they had no reference to her in speaking of this or that.

The day is bright and warm and we are planning a hay-rack party for the evening. Each girl is talking to all of the rest and bursts of hilarious glee greets the "grumbler" as she comes up the stairway. "We are planning a hay-rack party for tonight, Miss G. Hurry up," calls Miss Sunny Disposition. "It doesn't need me to help—it seems you've got it all planned," grumbles Miss Grumble. "I don't care anything about your old hay party, I have to work for Nellie tonight. I suppose that is the reason you had the thing because you didn't want me." "Well, I offered to work, dear," replies the sweet dispositioned girl. "But the chief operator says you owe Nellie the time. I'll work this time and let you go." "No you won't, you would want the time back just when I couldn't work. You girls have fixed up your party without me, now have it—enjoy yourselves—for pity sake."

The girl with the sunny disposition is not made, she is just natural. I realize that she will be an operator before she has had enough training to answer a call. She reports for duty with a smile on her face, and says "good morning," in such a cheery way that you feel that it will be a "good morning" for her, rain or snow. She is careful, courteous and kind at her work and in the retiring-room.

She never carries her work away with her, and never brings her outside affairs into the operating-room. She is full of life and laughter when she is off duty. When on duty, she takes up her work in a bright, quick little way and the very lightness in her heart comes out of her voice. She inspires confidence in those she is employed by and in the subscribers under her supervision.

Just as it takes shadows of night to show the brightness of the moon and stars, so it takes the shadows of petulance, stubborness, grumbling and selfishness to bring out the brightness of the girl with the sunny disposition. She can not help being a glowing example to the rest.

The harmonious feeling which prevails generally in our office, is the fruit of kindness on the part of the management, blended with the good will and good work of our operators and the warp of friendship which weaves us together has seldom a break.

After all, it is not so much our surroundings as ourselves that make or mar a day, for

"It's a gay old world when you're gay
And a glad old world when you're glad,
But whether you play
Or go toiling away
It's a sad old world when you're sad.

It's a grand old world if you're great.
And a mean old world if you're small;
It's a world full of hate,
For the foolish who prate
Of the uselessness of it all.

It's a beautiful world to see
Or it's dismal in every zone,
The thing it must be
In it's gloom or it's glee
Depends on yourself alone."

—An address by Miss T. Barnes before the Illinois Independent Telephone Convention.

ASPECTS OF TECHNICAL JOURNALISM.

THE growth of which Schenectady is in one great industry the distinguished expression carries with it the reason why the technical press has sprung into existence and has become a vital force. There was a time in the early days of the Institute when on looking over a list of its members I could claim to know every one of them—perhaps four or five hundred. To-day as I look over the list of 4,000 members—as I scan the Schnectady roster—there are scores and scores of names of men I never yet met. This is inevitable, perhaps it is best for them and for me. But given a growing art, an activity of creation in it, and an increasing number of men devoted to its prosecution, there seems absolutely no other satisfactory medium of intercourse for it except such a body as the Institute, or its technical and trade press.

It is hard to conceive how a man desirous of keeping abreast of invention, improvement, experience and discussion in his profession or industry can possibly do so if he does not read with at least moderate diligence his technical paper. Even the worst trade journal is better than none; and the best will leave a true hunger for knowledge sorely unsatisfied. The technical journalist is a specialist, he is cultivating a restricted territory, he is working with a microscope, all of which tells against largeness, broadness, liberality. Yet intensified cultivation has its merits, and many a patch of lilies in Bermuda, or vines in France, yields a far more valuable product than a sprawling wheat farm in Minnesota with its thin 15 bushels to the acre.

No technical man can find outside his special class journal the right intellectual food—tough, indigestible and badly cooked as most of it may be. The efforts of the daily press to be technical and supply valuable data, are laudable; the engineering supplement to the London *Times* is the best example of how far such a tendency can go; and the synopsis given in many American journals of scientific and industrial news are praiseworthy from the standpoint of the average reader. But much of what gets into print thus is to be regarded with suspicion, though reflecting no discredit on the daily whose pages it brightens. Now and again there is a book in the nature of a revelation, but the majority of the text-books in our schools and on our shelves are years behind the latest things going. These facts the sudent, in college or out, must get from the technical press. Being often asked for the latest book on a subject I have been struck with the frequency, the invariability with which one's recommendation unavoidably carries with it a number of articles recently printed in the technical press.

When Mr. Carnegie a few years ago opened the library at Braddock, Pa., he warmly advised the careful reading of the trade press; and in his suggestive lecture on business at Cornell University in 1896 he remarked: "You see, gentlemen, the business man of this day has to read, yes, and study, and go to the root of many things, that he may avoid the pitfalls that surround business on every side." In other words, the technical journal is an essential tool of professional, industrial and commercial life. When I meet a young engineer and discover that he has, unless for some valid reason, failed to join the national or local society of his branch of engineering, I find myself involuntarily putting a black mark against his name. When I discover also that he does not read regularly the journals of the art, he becomes more hopelessly "conditioned" in my mind, as one without professional pride and dignity, and as one who on his own confession does not keep himself so informed about progress that he can be properly useful in the world.

I have been formulating a plea or reason for the existence of technical journals as the clearing houses of current knowledge, as a necessary tool, as a means of intercourse, without any implication that any one of them is all that might be expected of it. Even human institution is branded with imperfection, and it is only of late years that most technical journals have even begun to attack the tasks before them or discharge the responsibilities resting upon them. Aside from the conceded inadequacy of the editors and managers, nowhere more painfully realized than among themselves, two very great difficulties steadily prevent these luminaries from being full candle-power. One of these is the inability to find men who have a story to tell and who can tell it well. The other is the reluctance of corporations and individuals to make public for common benefit the information acquired primarily for themselves in dealing with a subject, and often at enormous expense. Both these are evils and may be glanced at separately.

It may appear curious in these days, when it is supposed everybody writes, to complain that there is not writing enough. Lady Holland once said to Lord Porchester: "I am sorry to hear you are going to publish a poem. Can't you suppress it?" And when one wades through the countless popular magazines and the endless Sunday newspapers, and realizes how many beautiful miles of the forest fall daily under the axe to supply food for the ravenous presses of the age, it does seem as though the whispering trees would be better than so much loud talk. But as sinners against the Adirondacks the technical papers are venial offenders with their little editions, when compared with "yellows" boasting half a million copies daily, or "muckrakers" running a million a month. Those outlets for the productions of the intellect are always clogged with copy, but the technical journals in reality have little offered them voluntarily, and are frequently at a loss to get the right man to deal with a topic. For some inexplicable reason the phrase "an officer and a gentleman" does not find its equivalent in "an engineer and an author," although the engineer almost daily has an experience or an observation which if duly recorded would be of value and economy to every one else in the same field of work; and even if the single fact is of little utility a number of them might permit the generalization out of which great truths and great inventions would presently emerge.

If the technical journals could get more of these articles, they would pass in glad silence over the fact that the authors knew little of prosody or syntax, and have never used any but "simplfied spelling." The great want of the time is, indeed, the

ability to observe and then tell clearly and directly what is seen. This whole great electrical field of ours teems with obscure phenomena, with hints, suggestions, ideas, so that if a man notes something and does not know himself how to make use of it he can at least be useful by passing it on. There may be an improvement or a refinement in the art involved in the merest trifle; there may be the germ of a great invention. Chiefly thus does the improbable or the impossible become the prosaic and commonplace. "Numerous attempts have been made," said Herbert Spencer, in his treatise on "Education," "to construct electro-magnetic engines, in the hope of superseding steam, but had those who supplied the money understood the general law of the correlation and the equivalent of forces, they might have had better balances at their banks." These very works are building yearly thousands of dynamo-electric machines that supersede steam in every branch of industry, but the process of their creation since Spencer wrote, down to the moment when No. 6000 went on the Central tracks, has been one of almost imperceptible gradations of advance; and each advance has involved one closer observation of the conditions and facts to be dealt with in solving the problem. Such data are the very pith and marrow of the technical journal, and while I yield to none in profound admiration of the creative inventor—the Edison, Thomson, Rice or Steinmetz—I become more and more convinced that in large measure the magnificent growth during the past century in the arts and sciences is due to the swift printing and circulating of new knowledge, which even to the genius is stimulating food for thought.

Perhaps there might be more encouragement for such writing if it paid better. True. In this respect the technical field, with its small editions, cannot compete with the daily papers or the popular magazine. I know something of the affairs of four technical journals, and in not one of them does the subscription price begin to pay for the mechanical cost of production, the paper, presswork, ink and binding. Obviously the margin for the intellectual cost cannot be very great; and it is not. I have never known a millionaire among trade press publishers! I have never known one who did not stick close to his job, working strenuously day in and day out to build up and conserve the business and the paper. The fact is, the contributor to a technical journal, like the author of a paper before the Institute, must not overlook what we may call the "earned increment" that comes from publicity, enhanced reputation and the wonderful usufruct that flows in upon us every time we do a public service or a disinterested act.

That brings me to the other consideration I referred to in the mater of publicity. Roughly, possible writers for the technical press are grouped into men who couldn't and men who mustn't, leaving editors a very narrow range of collaboration. In other words, it is often to the interest of a great corporation to keep its mouth shut, and the casuistry of that situation has frequently caused me hours of perplexity. It all gets back to the old question of morals and sociology, how far a man has a right to that which is his own.

The fact that an important matter is not mentioned by the technical press does not imply ignorance of it. This year I published an article in regard to an important invention of which I had knowledge for at least four years. During that time not one word had I printed about it. The list of the recipients for the Carnegie medal for heroism ought really to include people who, under temptation, hold their tongues. Sometimes things leak in a mysterious way, sometimes in a nefarious way, but it may be questioned whether the case is on record of a technical editor who took, or paid for knowingly, the story of an employe giving away the confidential secrets of the company he had been serving. It could not well be otherwise. It is not a question of fear of losing advertising patronage. That is curiously exaggerated in the public mind. I do not know a technical journal that could not lose the advertising patronage of half a dozen of its largest patrons without the slightest financial injury in the long run.

As noted already, each corporation has its publicity or literary bureau, which does deft, clever work of a high informational value. In the technical field this tendency results in the diffusion of a great deal of useful data of benefit to everybody in the art, whether going directly at first hand into the columns of the press, or given to that more select and critical audience constituted by such a body as the membership of the Institute. The only objection to the present prevalent plan of spreading the same article profusely broadcast is that it becomes mutilated or emasculated because self-respecting papers object to print the same "story" *verb et lit.* just as though it were a mere electrotype. The other plan of inviting the editors to inspect a new appliance, and then give their own version, is better, even if they get it a bit wrong. One popular plan which has many obvious demerits is the modern house organ, where a corporation can say what it wants as it likes, and vaunt itself to the skies as to any new plant or product. Everybody discounts that kind of publicity immediately, and it carries no weight, even as compared with the issuance of exactly the same matter in a venal journal that makes a living by printing "write-ups." It is exactly the same kind of discount that an electrical journal is involuntarily subjected to by a general reader who peruses its advocacy of something electrical as preferable to something that is not. In the final analysis what we are all seeking is the truth published without bent or bias, without fear or favor.

Finally, a brief note on the journalist himself, the composite, mystical, elusive "we." More and more the "we" becomes a reality, however such a strong personality will assert itself and breathe in palpable form through the cold type, or exhibit itself in that exquisite thing called style. Without parading all the secrets of the prison house, I can say that in the paper with which I come nearest in touch, an editorial expression of opinion is very rarely that of one man. It is more often a blend, like good whiskey. One hand will contribute the fundamentals, others will furnish the harmonics and overtones, and when the editor who has least to do with it is complimented on his last admirable production, he will acquiesce in silent pride and complacency.—*Extracts from an address before the Schenectady Branch of the American Institute of Electrical Engineers by T. Commerford Martin.*

FALLACY OF FREE EXCHANGE AND CHEAP SWITCHING.

IN paraphrasing this subject, I will not usurp your time and patience with detail, but will endeavor to treat in a general sense and in a few words this inadequate practice.

Free exchange is parsimony rather than economy. It is "robbing Peter to pay Paul." A commercial axiom is: In getting something for nothing, some party to the transaction must suffer a loss. It is the design that has made gamblers out of those who might otherwise have been honest men. It is the project that has caused trusted employes to become criminals, and is contrary to the fundamental laws of business.

In order to accomplish this free exchange, there is a waste of energy and property connecting two or more systems without compensation and there is a waste of investment without adequate returns. There is a robbery of profit producing terminal systems to maintain a series of exhaustive connecting links which in themselves should at least be self-sustaining.

When we absolve an adequate connection fee, we must necessarily absorb the rentals, thereby depreciating the earning capacity of the terminal exchanges, the income of which is oftimes regulated by municipal legislation and upon which the hardship is most severe.

It is hard to convince the free exchange advocate that free exchange is false economy, owing to the fact that Independent telephony is yet in its youth and has not yet reached the age of physical reconstruction. It is pertinent, also, that the usual free exchange advocate is not a busy man that any old kind of service will satisfy, if it does not cost him anything, but to the busy man of affairs whose time is an element in his stock in trade, will appeal the toll line at so much per minute, from which is eliminated the "We had soup for dinner"; "Wasn't Mary's hat sweet"; "Our old cat caught a rat" sort of gossip in all its prolongations.

Another aspect of the situation where an each-one-owns-his-own sort of a happen-such-not-built-for-profit-exchange or switching center, is adjacent to a city exchange where an up-to-the-minute system is built and operated by business men who expect to derive a fair return from their investment, and free exchange is demanded by their cheap service neighbors, it does not require any argument to show the injustice that would be done the up-to-date exchange. Not only does the element of lost energy and maintenance cost enter into the connecting link, but the congestion of its local lines with free transit very often retards the service due its own subscribers, thus reducing the relative efficiency of its system.

Cheap switching encourages cheap construction—the root of poor service. In this age, intelligence commands a higher wage scale than the physical efforts of a human machine. However, it is essential to have the best combination of intelligence and skill at the switchboard to obtain the best results. Such a combination demands just remuneration, the payment of which commands adequate switching fees.

The American people are resourceful and progressive and they will bury this telephonic illusion in time. Some will awaken to the real situation through experience and illustration, while others will butt up against the proverbial stone wall—but it will ultimately be buried.—*Paper read by J. S. Daily before the annual convention of the Illinois Independent Telephone Association.*

Epitome of the Month

PERSONAL.

E. O. Arnold of Mount Vernon, Ohio, has become manager of the Mount Vernon Telephone Company.

C. W. Collins has accepted the position of manager of the Mount Vernon Telephone Company's exchange at Fredrickton, Ohio.

Charles R. Beel has accepted the management of the Inter-State Telegraph and Telephone Company's exchange at Sterling, Ill.

C. R. Sargent of Alexandria, Minn., has a contract for building two hundred miles of toll line in the vicinity of Lidgerwood, N. D.

William Donaldson of Plum City, has joined the maintenance force of the Osceola Farmers' Mutual Telephone Company at Osceola, Wis.

Harry Courson will have charge of the new telephone system to be installed at Pontiac, Ill., by the Livingston County Home Telephone Company.

J. J. Risk has purchased the telephone system formerly installed at Gorin, Mo., and will establish an exchange at Memphis, with the equipment taken over.

A. L. Schuler, formerly manager of the Wabash Valley Telephone Company at Paris, Ill., has accepted a position in the sales department of the Durant Electric Supplies Company.

W. D. Middlekauff has become manager of the Larned Telephone Company, Larned, Kas. He was formerly manager of the Farmers & Merchants Telephone Company of Pawnee Rock.

The late president of the Union Electric Telephone and Telegraph Company, Davenport, Iowa, Nandaiu Hamilton, has been succeeded by Geo. B. Stucker, formerly of Harrisburg, Pa.

Thos. Ainsworth has succeeded A. L. Schuler as manager of the Wabash Valley Telephone Company's exchange at Paris, Ill. Mr. Ainsworth was formerly with the Inter-State Telegraph and Telephone Company.

M. S. Connors, formerly chief engineer and sales manager of the Stromberg-Carlson Telephone Manufacturing Company, is now at the head of the telephone department of the General Electric Company, Ltd., London. Mr. Connors sailed about the middle of July.

J. L. W. Zeitlow of Aberdeen, S. D., was in Chicago recently on his return from an extended tour of Europe. He sailed from New York direct to Genoa and visited all points of interest in Italy, Switzerland, Greece, Austria, Servia, Germany, France and England. In his meanderings he studied foreign telephone conditions. Fortunately for Mr. Zeitlow, he found at Berlin an old schoolmate of his boyhood who held an important position in the traffic department of the National Telephone Company, Ltd. Through this friend Mr. Zeitlow learned many remarkable practices which prevail and which he will no doubt find time to dwell upon through the columns of the Independent telephone press. SOUND WAVES enjoyed a pleasant hour with Mr. Zeitlow upon the occasion of his call at our offices.

A number of changes has been announced by the American Union Telephone Company. W. P. Beardsley, who has been attending to the duties of district superintendent and general traffic manager, will relinquish the work as district superintendent and devote his entire time to the duties attached to the office of general traffic manager. He will be succeeded as district superintendent by Charles A. Carl of Chambersburg. Mr. Carl was manager of the Chambersburg division and William G. Underwood will take the position made vacant by the promotion of Mr. Carl. H. F. Snyder, division manager at Carlisle, has been moved to the same position at Williamsport, a much larger field, and A. M. Beardsley, a brother of the general traffic manager, has been appointed to take the position formerly held by Mr. Snyder.

NEW COMPANIES.

FORBES, N. D.—The Forbes Telephone Company has been incorporated.

SUNNY SIDE, Neb.—The Sunny Side Telephone Company has been incorporated.

ELLENDALE, Minn.—The Ellendale Rural Telephone Company has been organized.

COLUMBIA, Ohio.—The Columbia Mutual Telephone Company, Lorsin county, has been incorporated.

CLARK, S. D.—The Lake Township Rural Telephone Company has been organized with a capital stock of $2,450.

DEL RIO, Texas.—The Del Rio & Western Telephone Company has been incorporated with a capital stock of $20,000.

MOUNT VERNON, Iowa.—Mount Vernon Mutual Telephone Company has been incorporated with a capital stock of $1,200.

TEMPERANCEVILLE, Ont.—The King Telephone Company has been incorporated with an authorized capital stock of $10,000.

SEWELLTON, Ky.—The Sewellton Telephone Company has been incorporated by H. C. Rogers, L. P. Williams and F. L. Leach.

DECATUR, Ill.—The Home Telephone Company has been incorporated under the laws of New Jersey, with a capital stock of $300,000.

SEWELLTON, Ky.—The Sewellton Telephone Company has been incorporated, by H. C. Rogers, L. P. Williams and others. Capital, $3,000.

WATSEKA, Ill.—The Watseka Telephone Company has been organized by P. N. H. Munson, M. P. Turner and S. A. Walsh. Capital stock, $35,000.

GOTHENBURG, Neb.—A Farmers' Independent Telephone Company has been incorporated here, with a capital stock of $12,500 in shares of $50 each.

QUAKER, CITY, Ohio,—W. W. James, Isaac Cline, Geo. Lyman and others, have organized the Farmers' Telephone Company, with capital stock of $3,000.

BERLIN, Wis.—The Farmers' Telephone Company has been organized and incorporation papers have been drawn up and forwarded to the secretary of state.

CHARLESTON, Ill.—The Illinois Carrier & Telephone Company has been incorporated with capital stock of $1,000, by Henry M. Cabe, Frank Osborn and others.

MANDAN, N. D.—An Independent Telephone Company is being organized at this place by three local capitalists, who will invest $25,000. A franchise is being sought.

OAKLAND, Wis.—The West Oakland Telephone Company has been incorporated with capital stock of $3,500. M. C. Kravick, A. F. Olson and G. C. Larson are named.

CLEAR LAKE, Minn.—The Clear Lake Telephone Company has been incorporated with a capital stock of $50,000. The incorporators are: J. C. Sexton and J. S. Griffin.

PARK RAPIDS, Minn.—The Park Rapids and Lake George Telephone Company has been incorporated with capital stock of $1,000, by Horace Allen, A. W. Loff and others.

GEARY, Okla.—The Marple Telephone Company has been incorporated with a capital stock of $600. The incorporators are: Byron Baker, A. C. Gilrune and A. S. Schmyer.

HOUSTON, Texas.—The Houston Home Telephone Company has been incorporated with a capital stock of $1,000,000. Incorporators: J. S. Slusher, F. G. Reed and J. H. Dwyer.

WINNSBORO, Texas.—The Winnsboro Telephone Company has been incorporated with a capital stock of $15,000. Incorporators: W. D. Weir, R. L. Weir and C. B. Weir.

ELLSINORE, Mo.—The Farmers' Telephone Company has been incorporated with capital stock of $3,000. Lines will be built to reach Homestead, Grandin and Williamsville.

IOWA FALLS, Iowa.—Another rural telephone company has been organized in Hardin county, which will be known as the Oakwood and Owasa line. The capital stock is $2,500.

HARBESTER, Wis.—Geo. A. Howard is organizing an Independent telephone system, composed largely of farmers, in this vicinity. It is proposed to extend lines to Cornucopia.

GLENBURN, N. D.—The Lone Star Rural Telephone Company has been incorporated with a capital stock of $10,000. Incorporators: A. Walton, C. L. Matson of Glenburn, N. D.

HEBER, Ark.—The Heber and Brownsville Telephone Company is being organized to construct a line between the two towns. H. C. Brownsfield is president of the organization.

GEORGETOWN, Texas.—The Georgetown Telephone Company has been incorporated with a capital stock of $20,000. Incorporators: M. L. Sweet, Fred B. Robinson and Eni Sweet, Jr.

DESPLAINES, Ill.—The Royal Enameling and Stamping works has filed articles of incorporation, with capital of $150,000. John D. York, N. D. Kaplan and Fred W. Kraft are interested.

BANTRY, N. D.—The Bantry Telephone Company has been incorporated with a capital stock of $10,000. Incorporators:

James McIntyre, D. K. McKain, G. R. Case, H. Wylie and Fred Rusk.

BRISTOL, Tenn.—The Colby Telephone Company, Sullivan county, has been incorporated with a capital stock of $1,500. Incorporators: J. L. Mackey, H. Pettyjohn, James Barnes and others.

OAKVILLE, Texas.—An Independent Telephone Company has been organized here, with a capital stock of $12,000. The company will build a line from this place to Beeville, a distance of about 25 miles.

NORWALK, Wis.—The Norwalk Independent Telephone Company has been incorporated with a capital stock of $6,600. Incorporators: John Berendes, Leo Nolan, Chas. H. Schulte and four others.

UTICA, S. D.—The Central Farmers' Telephone Company has been incorporated with a capital stock of $25,000. The incorporators are: Lars A. Bruce, Edward Frank, Geo. Muller and John Ulmer.

WARREN, Okla.—The Warren Central Telephone Company has been incorporated with a capital stock of $25,000. The incorporators are: T. S. Woody, A. F. Hendricks, J. T. Baird and S. A. Biddy.

BELLEVILLE, Mich.—Farmers have organized a local telephone association and will build lines to connect with the Michigan State Telephone Company. H. S. Kiskadden, president; John Edwards, secretary.

BELGRADE, Mo.—The Belgrade Telephone Company has been incorporated with a capital stock of $1,500. The incorporators are: J. A. Easton, Frank R. McNabb, W. E. Nichols, John D. Robinson and others.

MOUNT PULASKI, Ill.—Mount Pulaski Independent Telephone Company has filed articles of incorporation, with capital of $8,500. The stock is divided into 240 shares of $25 each, and is held largely by farmers.

IOWA FALLS, Iowa.—The Oakland and Owasa Telephone Company has been organized with capital of $2,500, to construct rural lines. The stock is owned largely by farmers, and is divided into fifty $50 shares.

LISBON, N. D.—The Farmers' Southeastern Telephone Company has been incorporated with a capital stock of $10,000. Incorporators: Erick Sovde, McLeod; George C. Jacobson and Howard W. Gordon, Lisbon.

MEDFORD, Minn.—The Straight River Rural Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are: G. O. Lee, W. H. Boynton, W. F. Eaton, Joe Taylor and W. A. Bailey.

COLLIERVILLE, Tenn.—The Collierville Telephone Company, Shelby county, has been incorporated with a capital stock of $5,000. Incorporators: S. Hinton, L. T. Ward, W. T. Herfleet, E. A. Johnson and I. H. Irby.

ATHENS, W. Va—The Athens Telephone Company has been chartered with authorized capital, $5,000. Incorporators are: W. I. Ganter, D. H. Thornton, S. R. Holroyd, W. T. Appling and J. E. Pennington.

GENOA, Ill.—The Cracraft-Leich Electric Company has been incorporated with a capital stock of $100,000, to manufacture electrical devices. The incorporators are: John P. Cracraft, Oscar M. Leich and Sydney Stein.

CALEDONIA, Ark.—The Farmers' Independent Telephone Company has been incorporated with a capital stock of $3,000. Incorporators: J. P. Hall, president; S. B. Tadlock, B. H. Spiers, C. C. Jones and J. J. Smith.

UNIVERSITY PLACE, Neb.—The University Place Telephone Company, recently organized, has elected the following officers: R. French, president; T. M. Wimberly, vice president; H. M. Worley, secretary; W. Smith, treasurer.

GREENFIELD, Ind.—The Springtown Telephone Company, Hancock county, has been organized with a capital stock of $1,800. Directors: Roy Crider, Jas. Parish, Frank Carrier, Benjamin H. Binford and Liberty Tresse.

GRAND HARBOR, N. D.—The Grand Harbor Telephone Company has been incorporated with a capital stock of $5,000. Incorporators; S. Kongslie, Devils Lake, N. D.; O. N. Dion, and Chas. Reid, Grand Harbor, and others.

TORUN, Wis.—The Torun Telephone Company has been organized to build a farmers' system at this place. Lines will be built to Jordan, Stevens Point and Dewey. John Woznicki is president, and Arthur Van Order, secretary.

POMEROY, Ohio.—The Pomeroy and Middleport Telephone Company has been granted a charter authorizing a capital of $50,000. The incorporators are: W. M. Cray, Geo. and C. J. Schlagel, Chas. McNamee and J. W. McDonald.

ENGELAND, N. D.—The Engeland Telephone Company has been incorporated. It is expected that active operations will begin shortly, so that connections can be made with the Cando-Rock Lake line, now in course of construction.

ONEY, Okla.—The Farmers' Central Rural Telephone Company has been incorporated with a capital stock of $1,000. Incorporators: T. E. Green and M. N. Stewart of Lookeba. The company's lines will reach Lookeba, Binger and Eakley.

NORFOLK, Neb.—The Norfolk Long Distance Telephone Company has been organized and will be incorporated. W. J. Stadelman, C. H. Smith and T. E. Parmlee are the active promoters who are backed by Norfolk's leading business men.

MIDLAND CITY, Ill.—The Midland Telegraph Company has been incorporated with a capital stock of $10,000. The company will construct telephone and telegraph lines. Incorporators: Nathan S. Smyser, John A. McKeown and F. W. Raymond.

CANTON, Ill.—The Fulton County Telephone & Telegraph Company has been incorporated with a capital stock of $2,500, to construct and operate a telephone system in this city. The incorporators are: F. W. Plattenberg, M. J. Gorman and Lewis Thompson.

VERNAL, Utah.—The Uintah Telephone Company has filed articles of incorporation. The officers elected for the ensuing year are: William Smart, president; C. S. Carter, vice president; J. K. Bullock, treasurer, and R. S. Collett, secretary. Authorized capital, $10,000.

FILMORE, N. D.—The farmers between Esmond and Filmore have organized an Independent telephone company. It intends to construct lines between Esmond and Filmore. The following officers have been selected: O. Vold, president; John Steenerson, treasurer; B. S. Amdahl, secretary.

WASHINGTON, Maine.—The Washington Telephone Company has been incorporated with a capital stock of $1,000,000, and the following officers elected: Chas. Lynch, president; B. K. Ware, vice president; W. F. Hatch, general manager; W. E. Overlock, treasurer. Directors: W. O. Luce and W. W. Light.

HINTON, W. Va.—The Hinton, Clayton & Glenray Telephone Company, Hinton, has filed articles of incorporation. The company intends to build and maintain telephone lines, and has an authorized capital stock of $5,000. Incorporators: J. S. Graham and D. S. Ballangee of Clayton; T. P. Housby, S. C. Flint and J. H. West of Glenray.

TACOMA, Wash.—An Independent Telephone Company, to establish connections between Tacoma, Gig Harbor, Sylvan, Fox Island, McNeils Island and Anderson Island, has been organized by the business men of Tacoma and incorporation papers filed. The new company will be known as the Island Empire Telephone Company. The capital stock is $20,000. Among those interested are: C. S. Barlow, Edwin Miller, J. H. McFarland, Tacoma, and G. C. Pierce of Sylvan, Fox Island.

ELECTION OF OFFICERS.

WHITEHALL, N. Y.—At a recent meeting of the directors of the Co-operative Telephone Company, W. D. Gaul was elected vice president and general manager.

COVINGTON, Ind.—The new officers of the Parke County Telephone Company are: A. M. Adams, president; W. B. Thompson, secretary-treasurer; R. Burrin, manager.

ROANOKE, Va.—The Roanoke and Bedford County Telephone Company has elected the following officers: W. E. Wolfenden, president; R. L. Deering, vice president and general manager.

MILLSTADT, Ill.—Millstadt Telephone Company has elected the following officers for the ensuing year: Geo. Santhoff, president; Henry Tegtmeier, vice-president; A. C. Kern, secretary; A. J. Mollman, treasurer.

WAYNESBURG, Pa.—The Green County Telephone and Telegraph Company has elected the following officers: W. H. Bailey, president; C. W. Waychoff, treasurer; T. B. Lee, secretary and general manager.

LA CROSSE, Wis.—At the annual meeting of the La Crosse Telephone Company, the following officers were elected: I. H. Moulton, president; W. W. Cargill, vice president; W. F. Goodrich, secretary-treasurer and manager.

JANESVILLE, Wis.—At the meeting of the Rock County Telephone Company the following officers were elected: W. H. Palmer, president; F. C. Grant, vice president; Richard Valentine, secretary; A. P. Burnham, treasurer.

YANKTON, S. D.—The Yankton Independent Telephone Company has elected the following officers for the ensuing year: Fred Schnauber, president; R. H. Jones, vice president; F. L Van Tassel, secretary; W. H. Edwards, treasurer.

Longton, Kas.—At the annual meeting of the Longton Telephone Company the stockholders elected the following officers for the coming year: A. B. McKay, president; S. Crumrine, vice president; Lauren Hale, secretary; W. C. Boone, treasurer.

Scottsburg, Ind.—At a recent meeting of the stockholders of the Scott County Telephone Company, the following officers were elected: Irvin McCaslin, president; Mark Storen, vice president; John Montgomery, secretary; J. Ezra Thomas, treasurer; Chas. Guernsy, manager.

Concordia, Kas.—At the annual meeting of the Northern Kansas Independent Telephone Association, thirty-four companies were represented and the following officers elected: C. L. Brown, Abiline, president; H. L. Pierce, Belleville, vice president; D. C. Tyler, Clifton, secretary; W. W. Delworth, Beloit, treasurer.

Madrid, Iowa.—At the annual meeting of the People's Telephone Company the following officers and directors were elected: J. S. Kenison, president; T. R. Dresser, vice president; John Van Zandt, secretary and general manager; Oscar Oakleaf, treasurer. Directors: Wm. Roberts, E. P. Dalander, Henry Pies, L. F. Keigley and A. D. Larson.

Mount Pleasant, Iowa.—At the annual meeting of the stockholders of the Mount Pleasant Telephone Company the following officers and directors were elected: W. J. Streckel, president; R. S. Galer, vice president; W. E. Keeler, treasurer; E. E. England, secretary and treasurer. Directors: W. E. Keeler, Frank Montgomery, H. J. Twinting, R. S. Galer and W. J. Stockel.

Blenheim, Ont.—At the organization meeting of the Blenheim and South Kent Telephone Company the following officers and directors were elected: Dr. C. D. Lanferd, president; Neil Watson, vice president; George Taylor, secretary-treasurer. Directors: T. L. Pardom, W. J. Huffman, James Rutherford and others. The company is incorporated under the laws of Ontario, with a capital stock of $20,000.

FINANCIAL.

Hawkeye, Iowa.—The Hawkeye Telephone Company has increased its capital stock to $20,000.

Llano, Texas.—The Martin Telephone Company has increased its capital stock from $20,000 to $40,000.

Ayshire, Iowa.—The Ayshire Farmers' Mutual Telephone Company has increased its capital stock to $5,000.

Wakarusa, Ind.—The Wakarusa Telephone Company has increased its capital stock from $10,000 to $15,000.

Saginaw, Mich.—The Valley Telephone Company has paid its semi-annual dividend of 3 per cent, to 269 stockholders.

Grand Rapids, Mich.—The Citizens' Telephone Company has paid the fortieth quarterly dividend, amounting to $54,619.

Madison, Minn.—The Madison Telephone Company has declared a 5 per cent dividend on its outstanding capital stock.

Sunbury, Ohio.—The Delaware County Telephone Company has declared its regular semi-annual dividend of 6 per cent.

Arnett, Okla.—The Arnett Telephone Company has been chartered, with authorized capital of $10,000. C. O. Shaffer is president.

Murfreesboro, N. C.—The North State Telephone Company has increased its capital stock to $25,000. L. J. Lawrence is the principal shareholder.

Bruce, Wis.—The Chippewa Valley Telephone Company has filled an amendment to its articles of incorporation, increasing the capital stock from $10,000 to $25,000.

Baraboo, Wis.—The Freistadt and Cedarburg Telephone Company filed an amendment increasing the capital stock from $3,000 to $7,000. H. Klug, president, and Henry Suelflow, secretary.

McHenry, N. D.—The McHenry Telephone Company has been granted a charter authorizing capital of $15,000. The incorporators are: Anton Jensen, E. J. Horn, Chas. Burke and others.

York, Neb.—The York County Telephone Company has declared its ninth semi-annual dividend of 4 per cent. The net earning on the amount of stock issued is equivalent to 6½ per cent. for the past six months.

Cardenas, N. C.—The Cardenas Telephone Company has increased its capital stock from $1,000 to $3,000, and arrangements have also been made to connect with the Capitol City Telephone Company at Raleigh, N. C.

Hornsby, N. Y.—The Hornsby Telephone Association has increased its capital stock from $2,000 to $4,000. The company is incorporated and is doing a good business, connecting an extensive farming community into a common central at Hornsby.

Ely, Nev.—A special meeting has been called by the board of directors of the White Pine County Telephone Company, to consider the question of increasing the capital stock from $75,000 to $300,000. Large extensions in the system are under consideration. John Weber, secretary.

South Bend, Ind.—The directors of the South Bend Home Telephone Company have increased the capital stock from 2,000 shares of the par value of $100 each, to 4,000 shares of the par value of $100 each. The increased capital is to be spent in improving and extending the company's system.

Des Moines, Iowa.—The Mutual Telephone Company has increased its capital stock from $450,000 to $1,600,000, of which $1,000,000 is common stock and $600,000 preferred, of the par value of $100 per share. This issue is for the purpose of taking over and consolidating five outlying toll companies.

FRANCHISES AND TRANSFERS.

Fairfield, Ill.—Chas. E. Hilliard has purchased the Wayne County Telephone Company from W. B. Spriggs.

Lexington, Va.—The Lexington Mutual Telephone Company has bought the Buena Vista 30-year franchise.

Butler, Ohio.—A franchise has been granted to the Union Telephone Company to operate an exchange at this place.

Georgetown, S. C.—The Home Telephone Company has been granted a franchise to construct a system in this place.

Bonham, Texas.—The Texas Telephone Company has sold its entire system here to R. R. Derrett of Kentucky, for $27,000.

Maroa, Ill.—D. S. Anderson is seeking a franchise which will permit him to construct a line from this point to Argenta.

St. Peter, Minn.—The Nicollet County Telephone Company has purchased the system of the Sibley County Telephone Company.

Logan, W. Va.—A franchise has been granted to the Gilbert Telephone Company to construct a line from Gilbert to this place.

Garretson, S. D.—The Luverne Telephone Company has bought the Enterprise Telephone Company's lines in this vicinity.

Middletown, Ill.—S. A. Tyler, of San Jose, has been granted a franchise to operate an Independent telephone system at this place.

Tower City, N. D.—A franchise has been granted to the North Dakota Independent Telephone Company, to maintain a telephone system in Tower City.

Calgary, Alberta.—The Alberta government for a consideration of 20,000, has purchased the Alberta Telephone Company, Ltd., from J. E. Woods and H. E. Lyon.

Glasco, Kas.—For a consideration of $12,700, the Glasco Mutual Telephone Company has purchased the system of the Glasco Telegraph and Telephone Company.

Williamsburg, N. D.—The Citizens' Telephone Company of Williamsburg has been given an extension of its franchise in Leeds, Florence and Center.

Pingree, N. D.—The Pingree Telephone Company has been bought by the North Dakota Independent Telephone Company. It will install a local exchange in Pingree.

Blenheim, Ont.—The Harwich township council granted a franchise to the Blenheim and Harwich Telephone Company, to erect poles and run telephone lines through the municipality.

Wallace, N. C.—The Wallace Telephone Company has been granted a charter with capital of $3,000, to build a system in Wallace and make extensions in Duplin, Sampson and Pender counties.

Milford, N. Y.—A franchise has been granted by the village board to the Schenevus-Worcester Home Telephone Company of Schenevus, and work on the installation of its system will begun at once.

Harrisburg, Pa.—The American Union Telephone Company has purchased the Tri-State Telephone Company's extensive system in Pennsylvania, New York and West Virginia. The consideration is given at $500,000.

Butlerville, Ohio.—The Harlan Telephone Company has been granted a charter to operate a telephone system at this place. Capital stock, $5,000. Incorporators: J. T. Sharp, E. H. Smith, E. D. Jones, J. E. Sparling and Frank Carroll.

Middletown, Ohio.—Walter S. Harlan, representing Independent telephone interests, has been granted a franchise to operate an exchange. One thousand subscribers are pledged and the campaign has waged for more than six years.

SABETHA, Kas.—The Mutual Telephone Company, recently organized, has secured a 20-year franchise. The following officers have been elected: John Zug, president; F. N. Hollister, vice president; John H. Judy, secretary; J. E. Trees, treasurer.

GARDEN CITY, Kas.—F. R. Marsh has purchased the Garden City Telephone Light and Manufacturing Company, and is now sole owner of the concern. The property will be greatly improved and additions will be made to the plant and telephone lines.

WALHALLA, N. D.—R. H. Corsons of Bathgate, is securing the lease of the Walhalla-Neche line for the next 15 years, and will put in new lines to connect with it from Leroy and other points over the section of the country between Walhalla and Neche.

OGDEN, Utah.—The Independent Telephone Company here, is preparing to invade the southern Idaho field and compete with the Bell Company. The petition for a franchise will be submitted at the next regular meeting of the Pocatello city council.

ROCHESTER, N. Y.—The United States Independent Telephone Company has sold the Salt Lake City exchange to what is termed, the Elmer B. Jones syndicate, for $1,200,000. It is claimed that four hundred Salt Lake citizens are financially interested.

OAKLAND, Ill.—Milton Collier of Dana, Ind., has assumed control of the Embarras Telegraph and Telephone system, which includes the exchanges of Oakland, Borton, Isabel, Redmon and Kansas—about 1,000 telephones. Clarence Arterburn will be manager of the system.

FAYETTEVILLE, N. C.—The North Carolina Telephone and Telegraph Company has been granted a franchise to operate telephone and telegraph lines in this city. The company promises to put in a modern system, with full metallic circuits and long distance telephone connections.

ALEDO, Ill.—The new People's Telephone Company will ask the city council for a franchise permitting the corporation to set poles and extend its lines along the streets of Aledo. The company will greatly improve its telephone service in Mercer county and will increase its capital stock on procuring the franchise.

MORRISTOWN, Tenn.—The Home Telephone Company has been granted a charter by the secretary of state. The company has an authorized capital stock of $40,000. It proposes to construct lines through the East Tennessee counties of Hamblen, Hawkins, Greene, Grainger, Jefferson and Cooke. Exchanges will be constructed at Morristown, Jefferson City, White Plains, Rutledge, Rogersville, Tarte Springs, New Market, Greenville and Newport.

NEW CONSTRUCTION AND EXTENSION.

DANVILLE, Ill.—The Citizens' Telephone Company, besides establishing an exchange in Vermillion Grove, contemplates the construction of lines to Indianola and Christian.

TRINIDAD, Colo.—The Colorado Fuel and Iron Company is planning to install a system of its own, to communicate with its various mines. At present, the telegraph is used.

OMAHA, Neb.—The Independent Telephone Company has been granted a permit for a $5,000 additional story to its exchange building, at 926 North Twenty-fourth street.

MARYSVILLE, Kas.—The Marysville Telephone Exchange Company will make a number of rural line extensions in order to more thoroughly serve the patrons of Marshall county.

BRYSON CITY, N. C.—The Bryson City Telephone Company, capitalized at $5,000, plans extensive improvements. The stockholders are: J. L. Gibson, R. L. Sadige and A. M. Fry.

ELY, Nev.—The Utah, Nevada and Idaho Telephone Company is planning to construct a net work of telephone lines over the northern part of Nevada and the southern part of Idaho.

ELY, Minn.—The Masaba Telephone Company will make many improvements in its local system. Heavier poles and cable will supplant the all-open wire distribution that exists at present.

PINGREE, N. D.—The North Dakota Independent Telephone Company is putting in an up-to-date telephone exchange, having bought out the interest of the Pingree Telephone Company some time ago.

ELIZABETH, Ky.—The Home Telephone Company of this city and the Leitchfield Telephone Company, Leitchfield, proposes to connect the two cities with a new metallic toll line, a distance of 35 miles.

HUNTINGTON, W. Va.—The Independent Telephone Company of this city, will expend about $40,000 in changing the system to central energy. Manager Lon Hutchinson will be in charge of the work.

EMPORIA, Kas.—W. W. Finny, manager of the Emporia Telephone Company, is authority for the statement that his company will construct a new fireproof building, to be 50-85 feet, two stories and basement.

THOMASVILLE, N. C.—J. F. Hayden, manager of the Thomasville Telephone Company, will install cables. When the work is completed the entire system will have been overhauled, remodeled and put in first-class condition.

VAN BUREN, Ark.—The Farmers' Union of Crawford County, will construct a telephone line to Rudy. This is the first of a number of lines contemplated by this farmers' organization, which plans a system for the entire county.

FALLS CITY, Neb.—At a meeting of the board of directors of the Southeastern Nebraska Telephone Company, it was decided to install a new switchboard at the central office. Many other improvements were agreed upon by the board.

OKLAHOMA CITY, Okla.—The Citizens' Telephone Company will construct a building costing $62,000. The plans contemplate room for a switchboard of 10,000 lines. The company now has 2,500 subscribers. Geo. B. Roberts, manager.

PAXTON, Ill.—A new building is being arranged for the installation of a 450-line board and five miles of underground construction will be required in the rehabilitated system of the Paxton Telephone Company. C. M. Langford, manager.

BERKLEY, Va.—The new People's Telephone Company will build a line between Berkley and some point near the North Carolina state line. The officers are: J. G. Baum, president; V. Engell, vice president and secretary; C. M. Williamson, treasurer.

COLORADO, Texas.—The Texas & Pacific Telephone Company will reconstruct its plant at Snyder, substituting cable for overhead wire. The same company is building long distance lines from Roscoe to Snyder, along the right-of-way of the Roscoe, Snyder & Pacific Railway.

SIOUX CITY, Iowa.—The Sioux City Telephone Company will construct about 200 miles of new lines this summer. One line will connect Sioux City with a large number of towns in South Dakota, connections will be made at Salem and Mitchell; another will run from Sioux City to Omaha by way of the Burlington railroad.

FORT WORTH, Texas.—The Southern Telephone and Electric Company will erect a new exchange building and install a 3,000-line board. It also plans to extend its service throughout Weatherford and Parker counties. The officers are: W. D. Carter, president; E. P. Sawtelle, vice president; J. C. Caster, treasurer, and J. N. O. Rech, secretary.

MISCELLANEOUS.

ALBANY, N. Y.—The Greenfield Telephone Company of Ulster county, and the Hudson River Telephone Company have merged.

ROSEBUD, N. D.—The Rosebud Telephone Company and the Gregory County Interstate system have united and will be operated under and independent management.

APPLETON, Wis.—A special meeting of the city council decided to pass an ordinance requiring that all wires be placed underground within the business district of the city.

WATSEKA, Ill.—The two telephone exchanges here have merged into one, under the name of Watseka Telephone Company. The consolidated concern starts out with nearly 800 telephones.

OSCEOLA, Wis.—The Osceola Farmers' Mutual Telephone Company has made a 5-year contract to connect with the Amery and St. Croix Falls companies and not to encroach upon each others' territory.

ROCHESTER, N. Y.—Mayor James G. Cutler has appointed three to have complete charge of the reorganization of the United States Independent Telephone Company, who are as follows: Daniel B. Murphy, Walter B. Duffy and H. P. Brewster.

LISCOMB, Iowa.—Eleven Independent telephone companies in and around Liscomb, have consolidated under the name of Liscomb Independent Telephone Company. The new company has bought out the Liscomb Telephone Company. The change was effected August 1st.

JAMESTOWN, N. Y.—The United States Independent Telephone Company has announced that the Home Telephone Company of this city, is for sale. The franchise of the Home Company was drawn with a view to possible purchase of the plant by the city at some future date, and accordingly the city can buy the plant for its actual cost plus 10 per cent whether the U. S. I. care to sell it or not. The municipal telephone committee, of which H. E. V. Porter is president, will act in the matter.

Detailed Information Concerning Operating Companies

Sound Waves is a subscriber to the service of numerous clipping bureaus, and it is part of our business to issue daily a bulletin containing the more important items gleaned from these clippings and other sources. The items which appear in the bulletin are verified by communicating direct with the parties involved. For more than a year we have been asking telephone operators to furnish such data as we append below. Every item shown herein has been furnished on our blanks by a company representative, and it should, therefore, be authentic. Additional information and corrections are solicited. * Indicates magneto system; † common battery system; ‡ automatic system; Δ Bell instruments or connections; numerals, instruments installed.

ALABAMA.

†1,600—Mobile. Home Telephone Co. W. C. Polk, pres.; R. L. Douglass, sec.; W. H. Bryant, vice-pres.-mgr. Capital, $600,000. Inc., 1895. Rates, $3.00-2.00.

*12—Salitpa. Bigbee Telephone Co. T. L. Head, Jr., pres.; N. A. Molton, vice-pres.; C. T. McCroquodale, sec.; J. W. Fleming, treas. Inc., April 1, 1907. Capital, $60,000. Rates, $1.50-1.00.

ARKANSAS.

*300—Ozark. Home Telephone Co. William Hill, pres.; W. J. Pendergrass, vice-pres.; W. C. Conatser, sec.; J. B. Fulks, treas.; Eugene Hall, mgr. Capital, $100,000. Rates, $2.00-1.50.

Δ*77—Yellville. Ward Telephone Co. J. D. Simms, pres.; G. A. Ward, sec. and mgr. Inc., 1906. Capital, $15,000. Rates, $1.50-1.00 Branch exchange, Lead Hill.

CALIFORNIA.

180—Downey. Downey Home Telephone & Telegraph Co. L. K. Parks, pres.; A. E. Darby, sec.; A. Warden, mgr. Capital, $50,000. Rates, $2.00-1.50.

CANADA.

*160—Burgessville, Ont. Burgessville Telephone Co., Ltd. H. E. Service, pres.; Henry Sneathe, sec.; Martin Emigh, mgr. Inc., April, 1905. Capital, $40,000. Branch exchange, Norwich.

*600—New Liskeard. Temiskaming Telephone Co. Thomas McCamus, pres.; F. L. Hutchinson, sec.; John Pearce, mgr. Inc., April, 1905. Capital, $25,000. Rates, $2.50-1.50. Branch exchanges: Cobalt, Haileybury, Latchord, Ont., and Ville Marie, Que.

Δ25—St. Marys, Ont. St. Marys Medina Telephone Co. W. J. Atkinson, pres.; John W. Stewart, sec.; John Tool, treas. Est. Oct., 1906. Capital, $2,500. Rates, $1.00-1.00.

FLORIDA.

*260—DeFuniac Springs. DeFuniac Springs Telephone Co. S. K. Gillis, pres.; R. W. Stows, sec.-mgr. Inc, 1904. Capital, $9,000. Branch exchange: Laurel Hill.

IDAHO.

*†2,000—Boise. Independent Long Distance Telephone Co. E. H. Beggs, pres.; C. J. Sinsel, sec.; R. E. Haynes, mgr. Inc., 1901. Capital, $250,000. Rates, $3.00-1.00. Branch exchanges: Payette, Emmett, Caldwell, New Plymouth.

ILLINOIS.

Δ*700—Carterville. Carterville-Herrin Telephone Co. T. M. Logan, pres.; R. H. Hampton, sec.; H. P. Munger, mgr. Inc., May, 1903. Capital, $12,000. Rates, $2.50-2.00. Branch exchange: Herrin.

*550—Chester. Gorden Telephone Co. A. G. Gordon, pres.; C. Gordon Merdith, sec.; E. R. Gordon, mgr. Inc., 1898. Capital, $25,000. Rates, $2.00-1.50. Branch exchange: Steeleville.

Δ*450—Eureka. Eureka Telephone Exchange Co. H. W. Bullock, pres.-mgr.; F. B. Stumpf, sec. Capital, $5,000. Rates, $2.00-1.25.

Δ*450—Gibson City. Gibson Home Telephone Co. A. L. Philips, pres.; H. A. Ball, sec.-mgr. Inc., Dec., 1903. Capital, $25,000. Rates, $2.75-1.25.

Δ*800—Marshall. Peoples' Mutual Telephone Co. J. J. Meehling, pres.; J. L. Hawker, sec.; Robert Prewett, mgr. Inc., Feb., 1907. Capital, $5,000. Branch exchanges: Westfield, Walnut Prairie, Browns.

†2,968—Pekin. Citizens' Telephone Co. J. W. Barrett, pres.; John Fitzgerald, sec.; Geo. H. Glass, mgr. Inc., 1900. Capital, $200,000. Branch exchanges: Havana, Delavan, Manito, Green Valley, Lacon.

*546—Petersburg. Petersburg Telephone Co. H. H. Colby, pres.; D. W. Frockelton, sec.; W. C. Scott, mgr. Inc., 1905. Capital, $100,000. Rates, $2.00-1.00. Branch exchanges: Athens, Greenview.

†950—Rutland. Central Illinois Independent Telephone Co. C. G. Sauer, pres.; F. Z. Ames, sec.-mgr. Inc., 1900. Capital, $75,000. Rates, $1.50-.75. Branch exchanges: Wenona, Long Point, Dana and Magnolia.

240—Tampico. Farmers' Mutual Telephone Co. L. A. Wheelock, pres.; G. I. Sherwood, sec.; E. A. Emmons, mgr. Inc., 1902. Capital, $6,000. Rates mutual. Branch exchange: Rock Falls.

INDIANA.

*1,015—Angola. Steuben County Electric Telephone Co. L. Taylor, pres.; H. E. Wilder, sec. Inc., 1905. Capital, $100,000. Rates, $1.50-1.00. Branch exchanges: Pleasant Lake, Fremont, Orland, Ray, Metz, Salem Centre.

*1,200—Lebanon. Lebanon Telephone Co. A. L. Tetu, pres.; W. J. DeVol, sec.; Virgil Buntin, mgr. Inc., 1894. Capital, $30,000. Rates, $1.75-1.25.

*75—London. London Telephone Co. H. E. Harrell, pres.; O. H. McDonald, sec.; F. Weaver, treas.; R. L. Means, mgr. Inc. May, 1907. Capital, $5,000. Rates, $1.00-1.00.

Δ*750—Monticello. Monticello Telephone Co. M. T. Didlake, pres.; T. E. Honway, sec.-mgr. Inc., 1900. Capital, $30,000. Rates, $2.00-1.00. Branch exchanges: Buffalo, Idaville, Burnettsville.

Δ*490—Remington Telephone Co. E. Besser, pres.; Chas, Brand, mgr. Est., 1903. Rates, $2.00-1,00. Branch exchanges: Goodland, Wolcott, Reynolds.

Δ*850—Rising Sun. Ohio River Telephone Co. C. R. Green, pres.-mgr.; W. M. Green, sec. Inc., 1902. Capital, $75,000. Rates, $1.75-1.00. Branch exchanges: Vevay, Patriot.

IOWA.

*38—Ayrshire, Iowa. Ayrshire Farmers' Mutual Telephone Co. J. J. McNally, pres.; E. E. Morton, sec.; A. L. Taylor, mgr. Inc., 1907. Capital, $5,000.

†2,000—Grinnell. Interior Telephone Co. H. L. Beyer, pres.; W. S. Hendrickson, sec.; G. L. Sanders, mgr. Inc., 1900. Capital, $75,000. Rates, $2.00-1.00. Branch exchange, Montezuma.

*175—Griswold. Farmers' Mutual Telephone Co. Cyrus Boller, pres.; R. J. Kewin, sec.-mgr. Inc., March, 1907. Capital, $5,000. Rates, $1.25-1.00.

Δ200—Hawkeye. Hawkeye Telephone Co. R. W. Seling, pres.; H. J. Sorg, sec. Inc., Feb., 1906. Capital, $20,000. Rates, $1.00-.75.

*400—Madrid. People's Telephone Co. J. S. Kennison, pres.; John VanZandt, sec.-mgr.; Oskar Oakleaf, treas. Inc., 1901. Capital, $15,000. Rates, $2.00-1.25. Branch exchange, Luther.

†1,000—Mt. Pleasant. Mt. Pleasant Telephone Co. W. J. Stickel, pres.; E. E. England, sec.-mgr. Inc., Feb., 1902. Capital, $75,000. Rates, $2.00-1.50. Branch exchange, Trenton.

†1,600—Newton. Jasper County Telephone Co. A. K. Bergman, pres.; H. C. Korf, sec.; A. K. Morse, mgr. Rates, $2.00-1.00. Branch exchange, Colfax.

108—Ricketts. Crawford County Farmers' Mutual Telephone Co. C. Wendt, pres.; H. Foster, vice-pres.; August Meyer, sec.; A. H. Wendt, mgr.; J. C. Jacobson, treas. Inc., 1907. Capital, $10,000.

*835—Sidney. City Telephone Co. J. W. Tilman, pres.-mgr. Est. 1900. Capital, $50,000. Rates, $1.50-1.00. Branch exchanges, Tabor, Randolph, Imogene.

KANSAS.

*290—Burlingame. Burlingame Independent Telephone Co. J. P. Slaughter, pres.; L. P. Robinson, sec.; F. W. Stine, mgr. Inc., 1905. Capital, $12,500. Rates, $1.50-1.00.

*14—Colby. Halford & Colby Mutual Telephone Co. C. R. Neal, pres.; Jas. M. Stewardson, sec. Inc., 1907. Capital, $5,000. Branch exchanges, Halford, Mingo.

*1,000—Concordia, Kan. Concordia Telephone Co. F. W. Daugherty, pres.-mgr.; Frank Hannum, sec. Inc., 1897. Capital, $50,000. Rates, $2.00-1.50.

Δ*2,100—Emporia. Emporia Telephone Co. W. W. Finney, mgr. Inc., 1902. Capital, $60,000. Rates, $3.00-1.50. Branch exchanges, Neosho Rapids, Olpe, Plymouth.

Δ*700—Howard, Kan. Walker Telephone Co. A. B. Walker, pres.-mgr.; E. E. Walker, sec. Inc., June 26, 1906. Capital, $15,000. Rates, $2.00-1.00.

KENTUCKY.

Δ*350—Brooksville. Bracken County Telephone Co. Geo. Doniphan, pres.; H. L. Cooles, sec.-mgr. Inc., 1903. Capital, $20,000. Rates, $1.50-1.25. Branch exchange: Augusta.

Δ*16—Cunningham. East Telephone Co. F. P. Leath, pres.; J. W. Webb, sec.; M. J. Morse, mgr. Inc., 1907. Capital, $1,200. Rates, $1.00-1.00. Branch exchange: Bardwell.

*270—La Grange. Oldham Telephone Co. D. H. French, pres.; J. R. Clark, sec.; Geo. Fisher, mgr. Inc., 1903. Capital, $20,000. Rates, $1.50-1.00.

*400—Mayfield. Mayfield Home Telephone Co. J. E. Bergin, pres.; W. B. Stanfield, sec.; R. A. McCurdy, mgr. Inc., Feb., 1906. Capital, $50,000. Rates, $2.50-1.50.

MAINE.

Δ*210—Corinna. West Penobscot Telegraph & Telephone Co. T. F. Burrell, pres.; R. S. Knowle, sec.; H. W. Knowle, mgr. Inc., 1906. Capital, $50,000. Rates, $1.00-1.00. Branch exchanges: Exeter, Stetson.

Δ*102—Southwest Harbor. Island Telephone Co. G. H. Parker, pres.; G. A. Neal, sec.-mgr. Inc., 1907. Capital, $10,000. Rates, $1.25-1.00.

Δ50—Washington. Washington Telephone Co. Chas. A. Lynch, pres.; B. K. Wise, vice-pres.-gen. mgr.; W. F. Hatch, treas. Inc., July 10, 1907. Capital, $1,000. Rates, $1.00-1.00.

MICHIGAN.

7,500—Alma. Union Telephone Co. T. Kincaid, pres.; J. P. Gibbs, vice-pres.; L. L. Conn, sec.; G. S. Ward, treas.; W. J. Melchers, mgr. Inc., 1899. Capital, $750,000.

Δ950—Benton Harbor. Twin City Telephone Co. W. A. Preston, pres.; N. C. Kingsbury, vice-pres.; W. I. Mizner. sec.; C. H. Brewster, treas.-mgr. Branch exchanges: Berrien Springs, St. Joseph, South Haven, Watervliet.

†*300—Parma. North Parma Telephone Co. E. T. Borner, pres.; J. R. Fish, vice-pres.; Chas. Cockran, sec.; O. W. Wheller, treas.; Ernst Miner, mgr. Inc., 1901. Capital, $10,000. Rates, $1.00-.75. Branch exchanges: Spring Arrows, Concord, Springport.

MINNESOTA.

†400—Edgerton. Enterprise Telephone Co. C. S. Howard, pres.; L. W. Lockwood, sec.; F. E. Douty, treas. Inc., 1901. Capital, $50,000. Rates, $1.50-1.00. Branch exchanges: Jasper, Ruthton, Luverne.

*110—Ellendale. Ellendale Rural Telephone Co. W. A. Stanton, pres.; W. E. Galloway, sec.; E. M. Thompson, mgr. Inc., Jan., 1907. Capital, $10,000. Rates, $1.50-1.25.

†24,000—Minneapolis. Tri-State Telephone & Telegrah Co. E. H. Moulton, pres.; F. C. Nelson, sec.; O. Curtis, mgr. Inc., 1898. Capital, $5,000,000. Rates, $4.00-2.50.

220—Sleepy Eye. Sleepy Eye Telephone Co. I. M. Olsen, pres.; Wm. Brust, sec.-mgr. Inc., 1906. Capital, $30,000. Rates, $1.00-1.00. Branch exchange: Evans.

Δ†*2,100—St. Peter. Nicollet County Telephone & Telegraph Co. M. P. Quist, pres.; W. G. Lauman, sec.; C. C. Nelson, mgr. Inc., 1899. Capital, $100,000. Rates, $2.00-1.00. Branch exchanges: Cleveland, Gaylord, Gibbon, Kasota, Lafayette, Nicollet.

50—Union Hill. Union Hill Telephone Co. Joseph Widmer, res.-mgr.; A. A. Baskman, sec. Inc., May, 1907. Capital, $8,000.

MISSOURI.

*600—Fairfax. Fairfax Telephone Co. Eugene Rhodes, pres.; W. A. Groesbeck, sec.-treas. Inc., May, 1901. Capital, $24,000. Rates, $1.50-1.00.

Δ*100—Liberal. Liberal Mutual Telephone Co. A. Sims, pres.; J. R. McKibbin, sec.; A. E. Hathaway, mgr. Capital, $2,050. Rates, $2.00-1.00.

Δ150—Purdy. Purdy Telephone Co. W. J. Lough, pres.; Chas. A. Rose, sec.-mgr. Inc., 1907. Rates, $1.50-1.00.

MONTANA.

Δ30—Monida. Centennial Telephone Co. Robert T. Bootman, pres.; H. Wetmore, vice-pres.; Pearl I. Smith, sec.-treas. Inc., April, 1907. Capital, $20,000.

SOUTH DAKOTA.

*1,200—Yankton. Independent Telephone Co. E. A. Bruce, pres.; W. H. Edmunds, vice-pres.-treas.; J. J. Wagner, sec. Inc., May, 1903. Capital, $500,000. Rates, $2.00-1.00. Branch exchanges: Lesterville, Tabor, Utica, Mission Hill, Gayville, Yankton.

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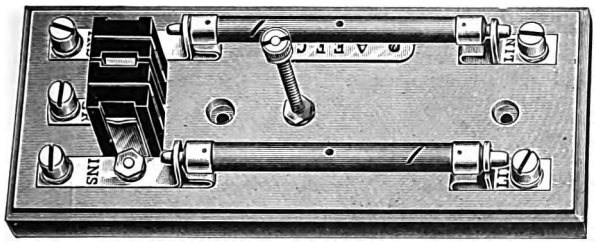

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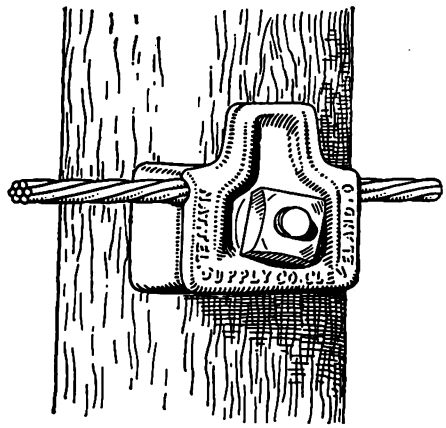

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No. 19. Central Energy Switchboards
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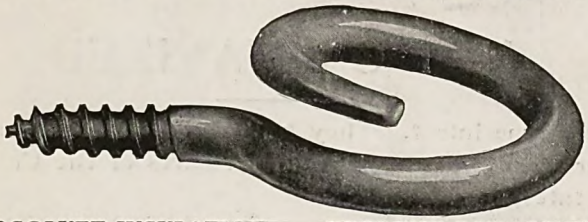

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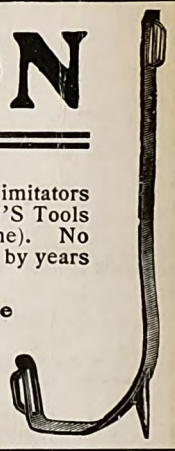

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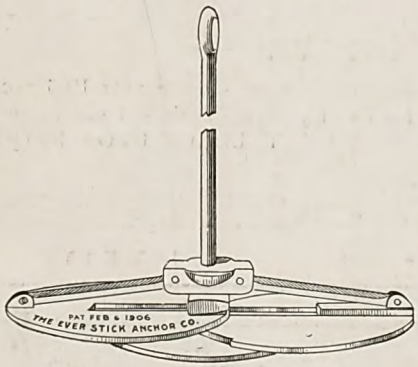

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SOUND WAVES

VOLUME XIV
No. 4

INTERNATIONAL TELEPHONE JOURNAL

SEPTEMBER 1907

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CHICAGO, SEPTEMBER, 1907

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1253-4 MONADNOCK BLDG

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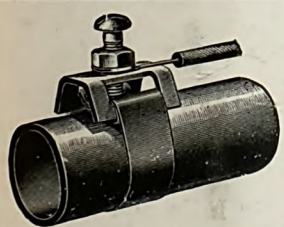

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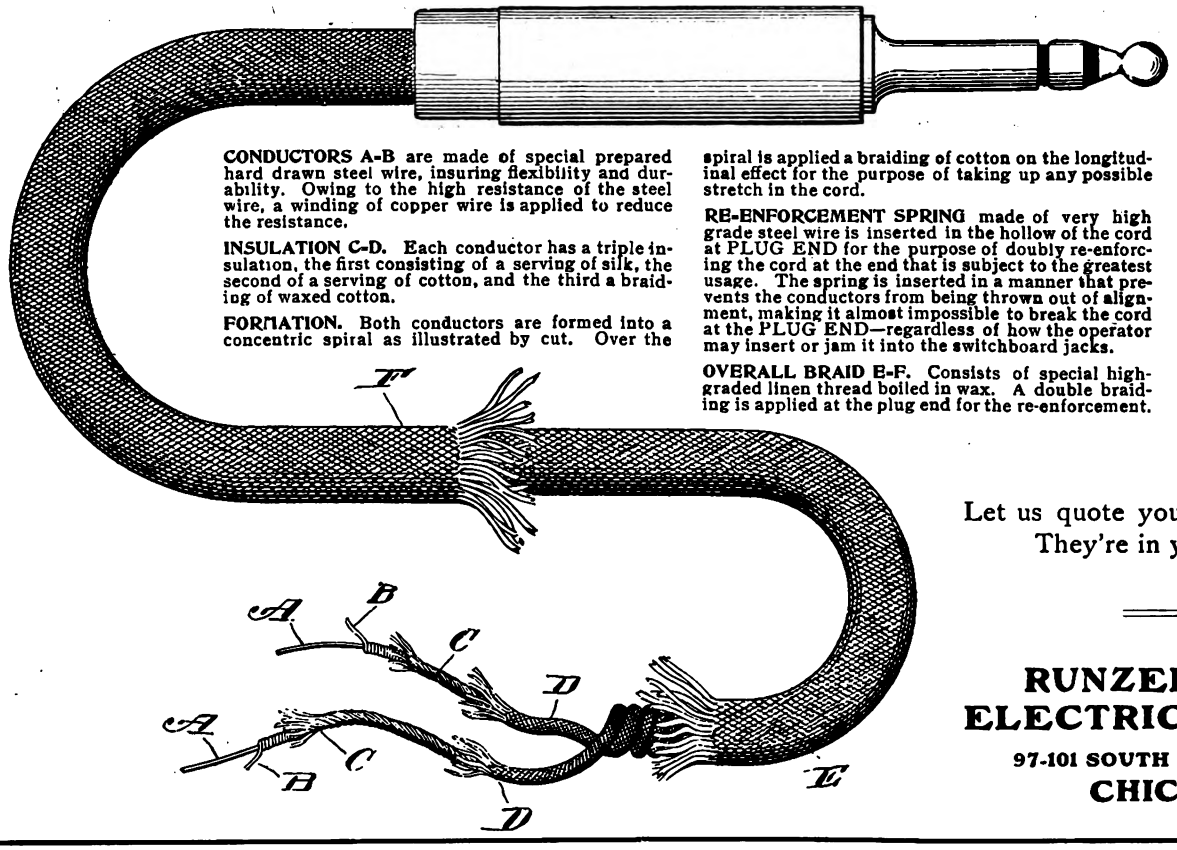

CONDUCTORS A-B are made of special prepared hard drawn steel wire, insuring flexibility and durability. Owing to the high resistance of the steel wire, a winding of copper wire is applied to reduce the resistance.

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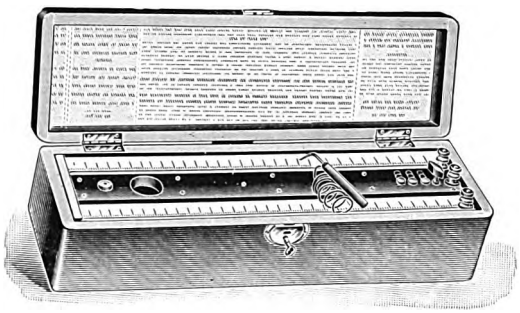

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SOUND WAVES

International Telephone Journal

VOL. XIV CHICAGO, SEPTEMBER, 1907 No. 4

ISSUED THE FIFTEENTH OF EACH MONTH BY THE

ELECTRICITY MAGAZINE CORPORATION

1253-4 MONADNOCK BUILDING, CHICAGO.

ED J. MOCK, Editor. F. M. BAILEY, Advertising Director.

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NOTICE TO ADVERTISERS.

Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisement can not be shown until the appearance of the edition containing it.

The publisher of SOUND WAVES *guarantees the advertiser a minimum circulation of 5,000 copies each month. During the six months prior to September, 1907, 30,732 copies were circulated, making an average of 5,122 copies for each month.*

CHICAGO, SEPTEMBER, 1907.

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RAISE YOUR RATE IF NEED BE.

THIS publication has had something to say on the subject of telephone service. It will have more to say in subsequent issues. We contend that the American public is willing to pay the top price for genuinely good things. The telephone manager who is giving ordinarily good local service and laments his inability to get into the long distance business and its allurements is making a serious mistake. Everybody had to creep a little before they walked. The exchange rendering first-class service in a very limited field is hard to find. First-class service is not confined to small places—it grows and grows until it is far-reaching in its ramifications.

One great trouble with the bad service system is its low rate. Somebody got off on the wrong foot at the start. The exchange was planned to reach too far with the limited, initial expenditure. Possibly someone got a "drag," substituting inferior supplies and apparatus. It is not improbable that the franchise giver came too high! Lots of things that come in the beginning look differently a little later on.

J. C. Kelsey has attempted to show, by diagram in this issue, that there is some fundamental rule which governs cost of exchange operation. The curves are only approximately correct, but they get *at* the subject in just a little bit different way than we have been used to. The diagram should receive the careful attention of every exchange manager and every individual who has to do with telephone securities. We sincerely hope that this matter will precipitate a discussion that will have a beneficial influence upon the telephone business.

Scattered through the news items in this paper are a few instances where the telephone rates are being raised. It is hopeful indication. The matter of rates have had too much the element of guess in them. The popular $1.50 for business and $1.00 for residence is only a haphazard, convenient, though meaningless price.

When the linotype made big papers and quick delivery possible, the country editor with an annual subscription charge of $2.00 or $1.50, cut the price to a dollar. He even attempted in his crude, unconventional way to bring out his paper twice a week to compete with his metropolitan brother. He's got over that sort of thing and the cut price has been pretty generally abandoned.

So it is with the operator. If good service is impossible at the present price, make it possible by raising the rate.

Of course there will be trouble—all mistakes are troublesome. Better do it, though, at this particular time rather than put it off. You know the old yarn about procrastination!

The telephone is indispensable; it's necessary; hard times won't pry it off the wall. You believe these things.

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You know that the best way to make your collections is with a screw driver. The subscriber will protest on a raise in the rate, but he will welcome your assurance that the service is to be improved.

Don't be alarmed about the "impending panic." You can't scare up any kind of a panic when your reliable old *American Agriculturist* tells you in its conservative, sober way that with a ten per cent shortage in crops this current, fiscal year of Our Lord, there will be returned to the farmer a clean billion dollars more for his harvest than he received last year.

If your rates need adjustment, get busy. Don't recall that you were told way back there somewhere, by an ambitious salesman, maybe, that your rate would be all right. Salesmen are not always to blame. You know present conditions as they particularly concern you—you know them better than anybody else. Let by-gones be by-gones; if you can not improve your service on the present rate, boost the rate.

This act on your part will enable you to buy better apparatus. Better apparatus costs more money. A demand for the better quality will encourage the manufacturer to treat his product with even better care than he does now. Telephones cost less today than ever before. Improvements in their manufacture is only partially responsible for this. The prices of raw material and wages are outrageously high and the tendency is still higher. The manufacturer will ultimately ask more for his product, forced by conditions which he can not combat. Be prepared for such contingency—look to your rates. The public has a peculiar way of adapting itself to changes that must not be confounded with business organization. The public always stands it—it has to—and we all belong to the big, open-hearted, generous populace.

Make your investment permanent, business-like.

Scoffers at improvement are like blind men sneering at the light.

RELATIVE VALUE OF MATERIAL AND LABOR.

In figuring the cost of a new exchange, or changes in an old one, there are in general two classes of costs—materials and labor. We get the cost of the former from the quotations of the manufacturers and supply houses. The latter comes from an inquiry into the local conditions of labor. Thus we become accustomed to value things by what they cost rather than their value in the work.

The price of anything is more or less governed by two factors—the cost of production and the demand for it. Usually the latter keeps the price sufficiently above the cost of manufacture to give the maker a fair margin of profit. On the other hand, special conditions may bear the price far above or below the cost of production. In a time of great public disaster men have often paid twenty-five cents for a newspaper which cost not over a cent to issue. In the telephone business we have often been obliged to sell a type of instrument far below its cost, because the invention of a new style made the old one out of date. This has a tendency to make the item of depreciation large.

In the routine of maintenance work these principles are often very prominent. Take some article of construction material which is inexpensive and under ordinary conditions it would be cheaper to use a considerable quantity and save the time of the man doing the work, rather than economize the material and waste the man's time in the attempt. If the workman is far from the base of supplies, with only a very little of the material with him, and he uses it with the usual freedom, there will not be enough to finish the job. This would necessitate returning for more, which takes valuable time. If conditions are such that he cannot return for a long time, it would leave the work in bad condition. Under such circumstances the material, though costing less than the man's time, becomes of more value. It will pay for him to take the time necessary to economize the material.

A wire man was once running a few electric light circuits for a company. The place had been measured before and just enough wire was purchased for the job. As he approached the end of the work he found himself with about a dozen pieces of wire and twenty-five feet of circuit to put up. If wire had been plenty, it would have been cheaper for him to use continuous lengths than to take the time to make splices, but there was no more wire, and the work had to be finished at once. There was no time in which to order more wire, so he spliced all the pieces together, at the cost of his time and additional gasoline, tape, and solder. The value of the wire in that case was more than it cost and more than the time of the man.

The relative values of material and labor are not always fixed by the cost or market value, but often by local conditions.

The dwarf may see the parade when mounted on the giant's shoulders. Thus do imitators get into business.

THE U. S. I. AFFAIR.

The most important development in Independent telephone affairs since the United States Independent Telephone Company defaulted on its bonds is the announcement of the plan of reorganization by which it is hoped that the dissolution of that company may be averted. As the company is affiliated with many other important telephone companies in the country outside of the Bell system, its future is a matter of considerable moment.

The plan of reorganization is a drastic one. Briefly, it contemplates the foreclosure of the mortgages of the United States Independent Telephone Company and the Independent Telephone Securities Company by the bondholders, the sale of the securities pledged under the mortgages to a new company, to be capitalized at $6,000,000, and the bonding of the new company for $3,250,000. As the present combined capitalization of the United States Company and the Independent Telephone Securities Company, which is included in the reorganization, is $30,000,000, of which amount approximately $15,000,000 is in bonds and $15,000,000 is represented by stock, it will be seen that this means a scaling down of the securities to exactly one-fifth of their present nominal value. It also means the elimination of the stockholders, because, in the words of the announcement, "there is not even a remote possibility that the foreclosure sales will produce enough to pay the outstanding bonds in full."

The holders of bonds of the United States Company will receive stock in the new company to the extent of 40 per cent of their holdings, but to do so they will be obliged to subscribe for bonds of the new company to the extent of 20 per cent of their holdings. The Independent Telephone Securities Company bondholders, which represent a small interest, will get slightly more favorable terms. The stock of the New York Independent Telephone Company, now controlled by the United States Company, and stocks and bonds of numerous small companies now controlled by the Securities Company, will not be placed under the new mortgage,

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but will be sold as soon as sales can be made to advantage.

The letter of the reorganization committee accompanying the proposed plan explains the reasons which have made such harsh action necessary. "Foreclosure actions must be brought," says the letter, "because both companies are in default and because neither can ever hope to pay the amount of its outstanding bonds." The letter goes on to state that the present disaster is largely due to overcapitalization, especially in the valuation given to the franchise of the New York Independent Telephone Company, on which nothing has ever been realized. The $6,000,000 capitalization of the new company is intended to represent the real value of the properties.

The committee strongly urges the acceptance of the plan, stating that if the $3,250,000 of new cash is raised in this way the rates of the Rochester, Syracuse and Utica companies raised, and the interest on the bonds of some of the companies reduced, the United States properties may weather the present storm without further loss to the bondholders than that already outlined.

The plan, to become operative, must obtain the consent of 90 per cent of the bondholders by September 15, 1907. In the event that 90 per cent of the bondholders do not assent to the reorganization plan, the reorganization committee will, nevertheless, buy in the property for those who do assent, and each assenting bondholder will be assessed an amount sufficient to pay off the non-assenting bondholders in cash. The principal subsidiary companies of the United States Company and the Securities Company are the Stromberg Carlson Telephone Manufacturing Company and the Independent companies of Rochester, Syracuse and Utica.

The temptation to work too hard.
How nobly some resist it!

Enterprise of Manufacturers.—Hand set heading.

WITH the spirit that has characterized the Swedish-American Telephone Company ever since it engaged in the manufacture of Independent apparatus, its president and founder is backing another enterprise of like kind in Canada. There is good reason to believe that the Dominion is ready for an Independent telephone plant. One province after another has denounced the Bell Company and has taken steps to enter the telephone business in competition with the monopoly. The export duty on telephone apparatus amounts to 27½ per cent—a cost out of all proportion when the prospective demands of Canadians are considered. Independent development in the Dominion has been phenomenal in the face of this condition.

The name chosen for the new Independent factory is the Dominion Telephone Manufacturing Company, Ltd. The capital stock is $250,000, of which $100,000 is preferred and $150,000 common. The site for the company will be found, no doubt, in the province of Ontario. Mr. E. B. Overshiner, president of the Swedish-American Telephone Company, is also president of the Dominion Company. We are confident he will meet with the deserved success in Canada that has favored his undertakings in Chicago.

But the Swedish Company is not alone in the matter of "doing things." The Monarch Telephone Manufacturing Company is about to move into a commodious new building planned for its reception and inclination to grow; the Dean Electric Company, Elyria, is adding new construction to its magnificent plant; the Vote-Berger Company is skirmishing around in North La Crosse for acreage enough to accommodate its expansion; the Eureka Electric Company, Genoa, has been succeeded by the Cracraft-Leich Electric Company—a vigorous organization headed by J. P. Cracraft; the American Automatic Telephone Company, Rochester, is about to move to Urbana, Ohio, where it will have a new, permanent home, possibly taking in with it the Select Telephone Manufacturing Company; and the United States Coin Register Company, Cleveland, will move into its new home in Monroe, Michigan.

These changes are only surface indications that are set down from memory, but they go to show that the manufacturing interests are preparing to take care of the Independent telephone business in keeping with its great growth. The permanency of the industry as a whole could ask for no better testimonial.

Noah drew pairs and got a full house. Who said Fan-Tan is the oldest game?

GET SOME "SHIELD THINGS."

HAVE you ordered any "shield things" during the past thirty days? You should. You can get genuine bargains of the International Independent Telephone Association by writing to headquarters. The association is going out of the supply business. It has a stock that has many things in it that you need.

Very few towns in the United States have enough shield signs. We know of none where the display of the shield has excited resolutions in the council chamber denouncing them as a public nuisance. Over in Grand Rapids, Mr. Tarte has encroached upon the danger point, but he has an aldermanic "pull" and a patronage pull as well, which speaks emphatically for his careful display of the International emblem.

Don't be backward about buying some signs. They are enduring advertisements and they will work like life insurance—protect you while you live and provide for those you leave behind. Spread the shield, and buy it now. Ask Harney for his circulars and prices—he's actually in earnest with his marked-down offerings.

Hot air rises. Wonder if that's how some people get to the top.

INDEPENDENT PROGRESS HURTS CHICAGO.

THE Citizens' Telephone Company has purchased the right-of-way and all poles and wires heretofore belonging to the Postal Telegraph Company, leading from Pekin to Springfield. This gives the Pekin Company two copper and three iron circuits through central Illinois, affording first-class long distance service to the state capital, where connection is made to full metallic lines reaching St. Louis and Kansas City. With the Kinloch connection at Springfield it is also possible for Independent telephone subscribers in central Illinois to talk as far east as Pittsburg. We are not unmindful that similar conditions exist in other Illinois cities, but the case at Pekin lends emphasis to the condition that business, which would naturally seek Chicago over Independent lines, is going elsewhere.

Every Independent system seeks a long distance outlet over Independent lines. The Bell cannot prevent this. To perpetuate the monopolistic franchise of the Chicago Telephone Company and deny the application of a competing company costs Chicago an inestimable annual loss.

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Of the 205 Bell exchanges in Illinois, the Chicago Telephone Company operates 111. It will give Independent companies Chicago connections, if the Independents will lease Bell instruments and discard present apparatus. In other words, surrender to the trust and become a subsidiary of one of the worst monopolies that has been permitted to manipulate a public utility. More than fifty-two per cent of the Chicago Telephone Company's stock is owned by the American Telephone & Telegraph Company of Boston. It isn't human nature for native sons with local investment to junk it and become a tiny part of a foreign, water-logged, debt-ridden corporation. Independents will not make the sacrifice, now or ever.

When Chicago will contrive a method whereby it may have Independent telephone connection with the rest of the world, cases like the one at Pekin will have a significance to its commercial welfare. As it is, we simply congratulate the Citizens' Company in an achievement which helps itself.

Don't be a boot licker. However, don't differ too loudly with those in power.

BOOST IN BELL NIGHT RATES.

The untrammeled arrogance of the Bell Company was never more clearly apparent than it is today. At a time when other great public service companies are under the ban of the federal government, and in the midst of a strike of the telegraphers, this monster of a telephone trust, with utter disregard for the public interest, is raising its long distance rates for night service to the high level of the day tariffs.

There seems to be no official reason for this boost in the rate. In keeping with the Bell policy, which has always been most incompetent as well as greedy, there will be no official reason. It is plainly another illustration of the contempt in which the public is held by the Bell Telephone Company. In some quarters it leaks out that the increased rate is necessary, because of the increase in night business brought on by the telegraph strike. Remarkable, isn't it, that the day rate wasn't boosted? There was no pretense that the increased day business made its handling unprofitable. There was no disposition to reduce the day rate during the dull hours. Instead of reducing the rate at a time when thousands of people who might require quick service would use long distance telephones for the first time, the rate was raised. The non-user knew that a half rate existed at night. He would try to employ the service as a last resort. He would endeavor to form the "telephone habit," at a rate he could partially afford. Zing! Up goes the rate. That's the Bell method.

Please don't tell us that the cost of giving long distance telephone service grows as the demands made upon the service increases. We know that. We also know that the night rate before the price was raised never cost the operating exchange any financial uneasiness. We hope, some day, to say something about costs in long distance operating. We've never looked at a record of any kind bearing on this subject, and we have never heard any person having to do with long distance service complaining about the lack of profit it returns. Seems strange, doesn't it?

We conclude that the Bell night rate received its boost simply because the Bell Telephone Company needed the coin.

TREATMENT OF POLES.

A marked saving in three directions—cost of equipment, of materials and labor, and of transportation—is being effected by the introduction of what is known as the "open tank" method of treating telephone poles. The general practice of preserving poles has hitherto been retarded by the heavy cost of closed retorts and other complicated equipment ordinarily used and the need of experienced men to operate them. Not until the poles grew scarce and rose alarmingly in price did users consider seriously the possibility of consuming less by making them last longer.

As a rule, preserving plants have been located at lumber centers, where a large business might be expected, and it has often been necessary to pay transportation charges to and from the treating plant on poles needed for local uses. The equipment of the open-tank method, which consists of an open tank, capable of withstanding heat and either equipped with steam coils or so arranged that fire can be placed underneath, is so simple and comparatively so cheap that it is within the reach of the smaller companies, contractors and farmers. The fact that it is portable gives it a distinctive value, since it can be taken, if necessary, into the heart of the forest, and even into the mountains.

One of the chief advantages of the open-tank process is that it can be effectively applied to the butts of telephone poles, without wasting preservatives on other parts. Fairly good results have been obtained in the treatment of arborvitæ, chestnut, and red oak, but the experiments thus far do not warrant the application of the method to the treatment of piling and ties made of these woods.

The open tank treatment is being rapidly developed, and while it ordinarily does not secure so deep a penetration of the chemicals as the retorts, it is sufficiently thorough to protect timber for practical purposes in many situations, and it is probable that future experiments will further extend its application.

Keep on the run, but not for the tall timbers.

THE CANADIAN CONVENTION.

The Canadians are going into the Independent telephone business in a manner altogether different from the familiar practice in the United States. It is pretty generally admitted that all Canadian operators want the government to help in the construction of long-distance lines. The advantage of having the federal government as a co-worker in developing the Independent business is something worth while. It will mean real competition for the Bell—a contest in which it will stand no chance of winning.

The resolutions offered and passed by the delegates in convention show the sincerity of the operators. The election of Dr. Demers as president of the association adds positive evidence that the fight will be along strictly Independent lines. It is unfortunate that the International Association could not be represented by its executive, who was to have attended. The manufacturing interests were out in full force, probably with an eye on the prospect of securing patronage for the new system to be built in Quebec.

The convention was not given over to lengthy discussions. It was confined to shaping a business organization to be used in furthering the progress of Independent Canadian telephonists against a common foe.

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Hand Generator Magnets

A Few Tests on Their Age and Methods of Magnetizing

By Arthur Bessey Smith

WITH a view of ascertaining the effect of age on the magnets of telephone hand generators, the experiments described in this paper were performed in the telephone laboratory of Purdue University. They were intended to be merely introductory, to open up the problem, and to get some idea of what may be expected to be found. Messrs. F. J. Strassner and A. J. Loeb, telephone students, performed the experiments under the direction of the writer.

An old generator was procured from the local Independent telephone company for the test. It was a three-bar affair which was evidently made quite a number of years ago. It was said to be one of the remaining relics of the old Harrison system, which operated at Lafayette at one time. The intention was to determine its condition as received from the telephone company, remagnetize the magnets by the ordinary method and see how much improvement it made. Assuming that they were originally magnetized in the same manner and to the same extent, this would give an idea of their deterioration during the period of their use. It was further desired to test the effectiveness of a method of magnetization which is not practiced by telephone manufacturers.

The test selected is sometimes known as "external characteristic" of a dynamo, in which the generator is loaded to a varying degree and the voltage and current taken for each different condition of load. Beginning with no load, the voltage is taken and recorded. A light load is then applied in the shape of non-inductive resistance, and the current and voltage measured. The resistance is reduced and the current and voltage read again. In this way the load may be carried to any point desired and the action of the machine discovered by plotting the current and voltage as a curve. The current is plotted horizontally and the voltage vertically. The speed of the generator must be kept constant during the test.

In looking about for a suitable instrument for measuring the voltage and current of the hand generator, some special conditions had to be considered. The ordinary alternating current ammeter has not been brought to the necessary point of delicacy for handling as small a current as was expected, which might run from a few milliamperes to nearly a tenth of an ampere, while most instruments possess such high resistance that they introduce considerable error. Voltmeters were to be had for alternating current which covered the range desired for the test, but they consume too much power by reason of their low resistance. A voltmeter having a range of 0.150 volt will often have from 1,800 to 2,000 ohms resistance. It will be seen that this alone constitutes a load for the telephone generator, and its addition to the circuit will change conditions materially. The Rowland electro-dynamometer filled the conditions more nearly than any other instrument available, so it was used for current and voltage. It has the disadvantage of lack of portability, must be handled carefully, and requires special curves and calculations, as its readings are not directly in volts or amperes; but as a laboratory instrument it is very satisfactory, especially for research work, in which a person expects to go to considerable trouble.

The crank was taken off the generator and a wooden pulley fitted on in its place. This was belted to a small motor which could be regulated to any desired speed. The ratio between the number of teeth in the large and small gears was taken, so that from the speed of the large gear the frequency of the current could be computed. An electrical device was used for counting the revolutions per minute of the pulley, which is illustrated in Figure 1. At the left of the figure is shown the pulley which drives the large gear on the generator. A segment of copper was attached to the pulley and connected to the shaft. A contact brush was fixed to make contact with the segment once in each revolution. This device was placed in series with battery and the motor magnet of a Clarke automatic switch, such as is used in that system of automatic switchboards. This switch is marked *selector* in the figure. The motor or rotary magnet actuates the wiper by a ratchet movement, causing the wiper to advance from one contact point to the next at each impulse of current through the magnet. There are about 75 contact points in the circle over which the wiper moves. One of these was connected to battery and a telegraph sounder, so that each time the wiper touched it, it would make the sounder speak. When the motor

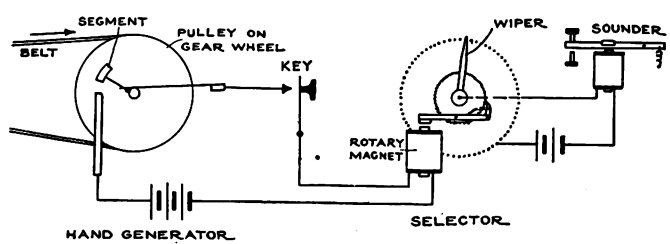

Figure 1.

was running the generator at full speed, the magnet on the selector made one movement for each revolution of the pulley. It took 75 revolutions to make the wiper go round once. Thus the sounder would click once for each 75 revolutions of the pulley and large gear, making it easy to count speed. The wiper would be set at zero with the key open. When ready to take speed, the key would be pressed and the clicks of the sounder counted for one minute. At the end of that time the key would be released, which stopped the selector. By multiplying the number of sounder clicks by 75 and adding the number of contacts over which the wiper had passed beyond the zero point the r. p. m. of the large gear was obtained. From this the frequency of the armature itself was easily calculated by using the ratio of the gears mentioned above. The average frequency used was 20 cycles per second.

Figure 2 gives the curves showing the results of the tests. Curve No. 1 is the characteristic of the generator as it came to us from the telephone company. It will be seen that it has an open circuit voltage of about 63 volts and that as the load is applied it falls quite regularly till at a load of 50 milliamperes (.050 ampere) it is only about 22 volts.

After running this curve, the magnets were taken off and remagnetized by the usual method used in telephone factories. This consists in placing each bar in turn across the poles of a powerful electromagnet. They are then removed from the latter, assembled according to proper polarity, and placed on the generator. In this

case care was taken to get the magnets back in the same order and polarity as they were before. Then Curve No. 2 was run in exactly the same manner as Curve No. 1 was run. It will be noticed that this is also very nearly a straight line, but that it is higher all along than No. 1. Starting at about 72 volts, it falls gradually to 26 volts at 50 milliamperes. Calling 25 milliamperes an average load, we see that the voltage of No. 1 is 14.3 per cent less than that of No. 2 at the same point. If we are allowed

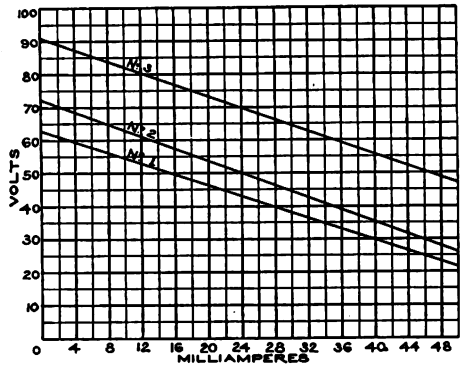

Figure 2.

to assume that the magnets were originally magnetized to the degree shown by Curve No. 2, then the power of the generator has fallen off by 14.3 per cent since it was made.

Before the tests were started, Prof. J. Walter Esterline, the well known authority on dynamo design, called attention to the loss in magnetic intensity which inevitably occurs in the ordinary method of magnetization and suggested that manufacturers would do well to consider magnetizing by application of a coil directly to the bars after they have been assembled on the pole-pieces. No matter how strongly they are magnetized, the moment the magnetic circuit is broken the intensity falls and never regains its original strength. But if a coil be applied to the bars in place as in Figure 3, with the armature also in place, the magnetic circuit will not need to be broken after magnetization and will retain greater strength than by the old method. To test this point the wire was applied as indicated in Figure 3, there being 53 turns. A current of 100 amperes was passed through the wire for a very short time, long, enough to magnetize,

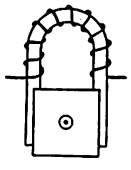

Figure 3.

but not long enough to overheat the wire. Then Curve No. 3 was run. This shows a marked increase in power. The open circuit voltage is 90, falling off to 47 volts at 50 milliamperes. The open circuit E. M. F. is 25 per cent higher than Curve No. 2 and 43 per cent higher than Curve No. 1. At the 25 milliampere point the comparisons are as follows: Curve No. 3 is 41 per cent higher than No. 2 and 64 per cent higher than No. 1. Perhaps a better and more fair comparison of performance would be to see what the generator would do if made to furnish current to a circuit of fixed resistance. Let us fix this at 2,000 ohms. In its original condition, as shown by Curve No. 1, it would give 22.3 milliamperes (.0223 amp.). As remagnetized by the ordinary method, it would give 24.6 milliamperes through the same resistance. As remagnetized by Professor Esterline's method, it gave 31.6 milliamperes. The results are collected in the accompanying table, which will show at a glance the great improvement made by the new method of magnetization.

COMPARISON OF GENERATOR PERFORMANCES—OUTPUT THROUGH 2,000 OHMS NON-INDUCTIVE RESISTANCE.

Condition.	Amperes.	Volts	Watts.
Old magnets	.0223	44.6	0.99
Remagnetized	.0246	49.2	1.21
Esterline's remagnetization	.0316	63.2	1.997

The load of 2,000 ohms non-inductive resistance represents approximately three or four 1,600 ohm bells in parallel. Bells vary so greatly in their characteristics that to say that a generator will ring a certain number of bells is an extremely inaccurate way of stating its capacity.

Though the high results to be obtained by this method of magnetizing may not be questioned, there are two practical points which at once suggest themselves to the engineer. The first of these regards the bother of

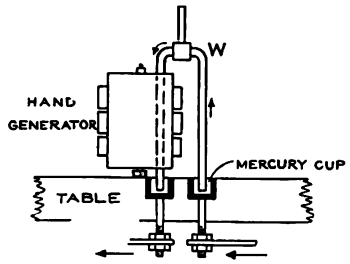

Figure 4.

winding wire around the bars after they are in place, which would make the method too costly in the time of the workman employed on the job. This is obviated by using large current at low voltage with a device shown in Figure 4. *W* represents several U-shaped bars or heavy wires, fastened to a suitable holder above the table. They are adapted to be moved vertically to admit the insertion of the completed generator (except large gear and shaft) and when dropped down fit into mercury cup in the table, through which the current is fed to them. Figure 5, *A* shows the plan, with the U-shaped conductors in place.

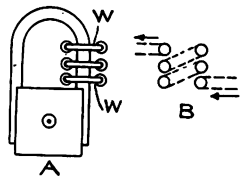

Figure 5.

B in the same figure shows how the current is carried from one U-shaped conductor to the next so that the current will be made to circulate in the proper direction around the steel. In the test above described the magnetizing force was 5,300 ampere-turns. If only three U-shaped conductors were used, it would take 1,666 amperes to produce 5,000 A. T. But there is no reason why a dozen conductors should not be arranged side by side within the space available. This would reduce the amperes to 417, which could be easily furnished by an electrolytic generator.

The operation would be as follows: Place the hand generator in place, according to guides, lower the U-shaped conductors into the mercury cups, turn on the current, turn it off, raise the conductors, remove the hand

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generator and substitute the next. A single lever could be arranged to lower the conductors and operate the switch, thus reducing the time required to a very small figure. There is no necessity for leaving the current on any longer than required for it to reach its full value.

The second point is that if after the generator has been put into service any one takes the magnets off, or removes the armature, the magnetism will be as effectually lowered and permanently impaired as if the old method had been employed. This is true and must be considered. It is not intended to make this new method an excuse for making generators of the same power as the old ones by reducing any of their dimensions and using the new method of magnetization, for this would not be fair to the user. The first time he took one apart it would reduce its power below that of generators made on the old plan. But rather it would be better to keep the same dimensions and by using the new method obtain a generator of greater power than before. A further point is that where the magnetization is pushed to a high degree, the loss that comes with time, or handling, will not be as great as if the magnetization were but partly done. Moreover, if a man wishes to remove the armature without breaking the magnetic circuit, he has only to place the generator on some flat iron surface, such as the top of a stove or an anvil, and keep it there while the armature is out. The iron will keep the circuit for lines of force closed till the armature is replaced.

Before leaving the subject, it will be well to look a little at the slope of the curves and see if we can tell anything about the generator itself. On Curve No. 1, the open circuit voltage is nearly 63 volts. When loaded to 50 milliamperes the terminal voltage has fallen to 22 volts. Where have the 41 volts gone? They are lost in the armature. The terminal voltage of the generator is lowered in three ways, by the back ampere-turns or the demagnetizing effect which the current has on the field, by the resistance of the armature wire, and by the inductance of the armature. As the current is relatively very small, it is very unlikely that there is an appreciable demagnetizing effect in this particular generator. This leaves resistance and reactance to account for the loss. By measurement with the Wheatstone bridge the armature resistance was found to be 515 ohms. Some point on the curve was then selected and the voltage subtracted from the open circuit voltage. This gives us the lost volts for which we must account. Dividing the lost volts by the current at this point gives us the impedance of the armature, which is designated by the letter z. For Curve No. 1, this was found to be about 830 ohms. Calling the reactance x and the resistance r, we have the following relation,

$$z = \sqrt{r^2 + x^2}$$

Knowing $z = 830$ and $r = 515$ we can easily calculate $x = 651$. If the curve is a straight line, both the impedance, z, and the reactance, x, will be constant. The values for the three curves are shown in the following table:

	Impedance.	Reactance.	L.
Curve No. 1.....	830	651	5.18 henrys
Curve No. 2.....	956	805	6.41 henrys
Curve No. 3.....	856	688	5.48 henrys

If we consider the power which is lost in the generator, we shall find some interesting facts. Since the external resistance is non-inductive, the power is easily found by multiplying the volts by the amperes. This is what was done in the table comparing the output through 2,000 ohms which was given above. The watts there given are power delivered to the outside circuit. The power lost in the armature will be found by multiplying the square of the current by the resistance of the armature. It will not do to figure it the same way that we did the external circuit, for this is an inductive coil. Applying this method of figuring to the 2,000 ohm external circuit a table has been prepared which shows the total power developed electrically and what becomes of it. It does not take account of all the power which the subscriber puts into the crank, for that is lost in friction, eddy currents and hysteresis in the magnetic materials of the generator, and do not figure into these tests. In the last column, the efficiency is the *electrical efficiency*, not the total or mechanical efficiency.

COMPARISON OF GENERATOR PERFORMANCE AND EFFICIENCY THROUGH 2,000 OHMS NON-INDUCTIVE RESISTANCE.

Condition.	Amps.	Volts.	Watts Generated.	Watts Deliv.	Watts Lost.	Per Cent Efficiency
Old magnets.....	.0223	44.6	1.246	0.99	0.256	79
Remagnetized	.0246	49.2	1.522	1.21	0.312	79
Esterline's remagnetization	.0316	63.2	2.511	1.997	0.514	79

From the above it appears that the increase of intensity of magnetism gives us a greater output into the same resistance circuit, but that the electrical efficiency is not materially changed.

As a result of the tests, besides showing the gains from the new method of magnetizing, it will be noticed that there is a very large loss of energy in the armature. This is somewhat greater than shown by the 79 per cent, for the ability of the machine to ring over long lines is partly dependent on its ability to hold up its voltage while delivering current, which this generator does not do very well. It is believed that modern generators will show up much better, as they are wound with larger wire and more economically put on, also larger steel magnets are used and of better quality.

Telephotography in Germany.

Consul Thomas H. Norton of Chemnitz reports as follows concerning the German development of telephotography:

Much attention is now paid in Germany to the remarkable measure of success which has attended the intsallation of Professor Korn's invention for the transmission by wire of photographic reproductions over long distances. His latest experiments show that nearly as satisfactory results are secured by making use of ordinary telephone wires as on lines specially constructed for the purpose. The only difficulty encountered on telephone wires results from calls on adjoining wires. These cause the formation of zigzag lines on the reproduced picture at the receiving station, which are easily corrected by retouching. Alterations in current intensity by ringing on or ringing off, as well as during conversations over adjoining wires, are without effect. It is further shown that the wire employed for photographic reproduction can simultaneously be utilized for telephonic conversation.

The advantages thereby accruing, to journalists more particularly, are self-evident. In these days, when so many newspapers have private wires or lease a wire to a distant city for a certain time during the night, a correspondent can telephone his dispatches and at the same time transmit the desired illustrative material. The first journal to utilize the new invention is the Copenhagen daily *Politiken*, which has ordered a complete installation for telephonic and telephotographic communication with its Berlin office.

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Syracuse Independent Telephone Exchange

By H. C. Slemin

IN the Spring of 1905, several prominent Syracusians began to take keen interest in the subject of telephony, and after associating themselves with a number of Rochester capitalists, who had a good deal of experience in the Independent development, organized the Independent Telephone Company of Syracuse with a capital of $1,000,000. This company acquired all the rights and property of every kind from the old Syracuse Telephone Company, the Columbia Long Distance Telephone Company and the People's Subway Company, who began the development of Independent telephony in Syracuse in 1899.

Home of the Independent Telephone Company, Syracuse.

The plants of these three companies were in poor condition and inadequate in many respects to take care of the increasing business demanding more efficient service, and the principal reason for the purchase of them was to enable the new company to equip and extend its system to the proportions and efficiency of neighboring exchanges at Rochester, Buffalo and Utica. From the beginning, the new enterprise was well received by the public and the company commenced with a large number of local subscribers in the business and residential sections, and also gave long distance and some toll service. Syracuse has become a most important terminal point for the entire New York state and part of Pennsylvania, and has connected the eastern and western localities that heretofore remained separated until its toll lines were in service.

The Independent Telephone Company of Syracuse purchased and remodeled for complete occupancy for commercial purposes the building which the late eccentric millionaire, D. Edgar Crouse, constructed for private club house and stable, at an expense estimated at $400,000. The new exchange is probably without a peer in the country or world in the luxuriousness of its appointments. No other telephone company can boast of solid silver door knobs, of cut glass chandeliers and mahogany mantels in the telephone girls' recreation room, and in the office of the traffic manager, of a general manager's office, the walls and ceiling of which are carved rosewood with a piano finish, and of a directors' room with a massive mahogany hand carved mantel with paneled walls and ceiling of the same wood elaborately carved. The telephone company made several changes in and about the building to adapt the structure to its service. A large addition was built on the rear, the second story being extended up, doubling the floor space on the third floor, which has been transformed into one large and well lighted apartment where the 12,600 central energy multiple switchboard, manufactured by the Stromberg-Carlson Telephone Manufacturing Company of Rochester, New York, is installed.

The toll board is located in the old billiard room, as is easily seen by the elaborately carved representation of billiard balls and cues, which form a centerpiece over the mantel. The room is furnished in mahogany, birdseye maple and white locust. The floor is a pattern one of mahogany and oak combined. More space would permit a lengthy description of various interesting features in the construction throughout the building.

The piece-de-resistance in the decoration of the dining room, which is now maintained for the operators, is a massive cut glass chandelier which is put together without the use of any metal. The gas which supplies the numerous burners, passes through hollow pieces of glass, which figure in the decorative features of the chandelier, no metal pipes being used.

The main exchange room, which occupies the third floor of the building, has 5,000 square feet of floor space and is lighted by numerous windows on three sides. The steel ceiling and the walls have been enameled white, which enhances the light effect. Dark green trimmings relieve the monotony of the vast expanse of white.

Main Exchange Operating Room and Switchboard.

In the eastern half of this apartment the switchboard is installed, which is the latest lamp line signal, relay multiple, central energy switchboard of 12,600 lines frame capacity, equipped for the present operation of:—1 incoming trunk operator's equipment, 6,000 central energy subscriber line equipments, 50 local operators'

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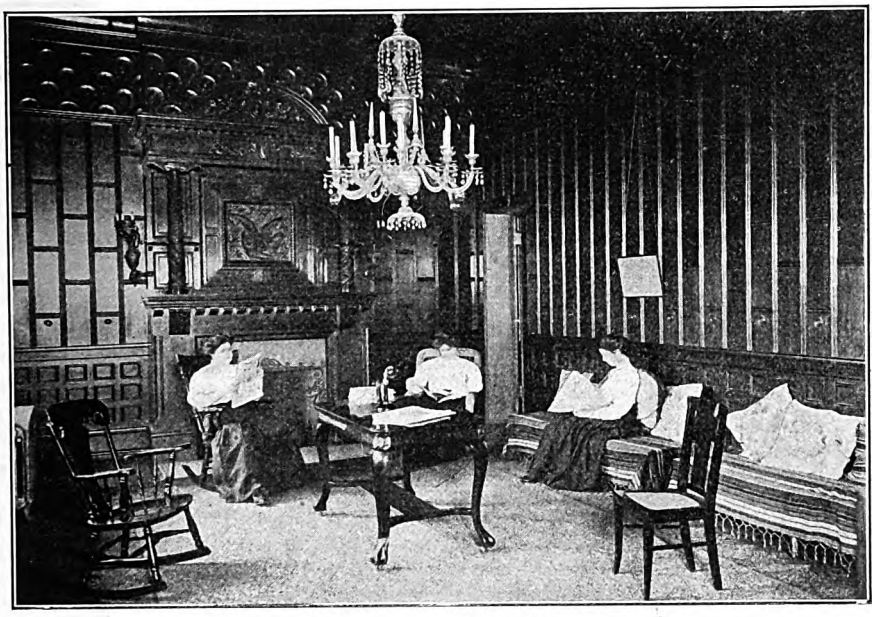


Operators' Retiring Room.

equipments and 40 local outgoing trunks. This equipment is distributed in 51 operators' equipped positions, including a trunk position, assigning 120 central energy subscribers' lines to each regular operator's position. The main switchboard consists of 18 sections of 3 operators' positions each, of the nine-panel type in the multiple, trunk and answering space, and the arrangement is such that the first position of the first section shall be a multiple annex position, while the second and third positions of this same section are arranged as an incoming trunk position. All of the positions of the sixteen sections and the first and second positions of the eighteenth section are wired and equipped complete for 120 lamp line equipments, making a total suitable for the present operation of 6,000 central energy lines. The third position of the last section is also equipped as a multiple annex position.

The multiple jacks for a capacity of 12,600 lines are arranged in each section of three operators' positions, distributed in 9 panels. The space immediately below the multiple jacks is provided for installing the outgoing trunk jacks in strips of twenty, of a capacity for 360 lines. Below the trunk line space are mounted the lamp line signals and answering jacks in strips of ten, providing for an ultimate of 150 lines in each operator's position with 120 equipped at the present time.

The switchboard contains 108,000 multiple spring jacks distributed in 18 sections, all connected in multiple throughout the switchboard and with the corresponding answering jacks—6,000 being multipled in each of the 18 sections. The jacks are mounted in strips of 20 and have a German silver thimble and individual springs for both tip and sleeve side of each line. The answering jacks are of corresponding design, mounted in connection with the lamp line signals of one-third candle power, and numbered by means of removable lamp caps associated with the answering jacks. Individual transparancies bearing the number of the subscriber's line are furnished with the lamp jacks.

Of the rest of the equipment more can be said than space permits. In each regular operator's position there are 15 pairs of cords, with double lamp supervisory signals wired so that one lamp indicates when a called subscriber has "hung up" and the other when a subscriber is "waiting," or when both have "hung up"; also a new type vertical cam-ringing and listening-keys, associated apparatus, operator's breast-plate equipment, five order wire keys and pilot equipment.

All cables used in this switchboard are made of No. 24 B. & S. gauge, tinned annealed copper wire, 98 per cent, covered with two layers of silk and one of cotton; the outside layer of cotton is colored in accordance with a predetermined color code to facilitate rapid handling and testing of the lines. The dye in these cables is such that will not impair the insulation of the wires and was prepared and mixed in accordance with the formulas of the Stromberg-Carlson Telephone Manufacturing Company.

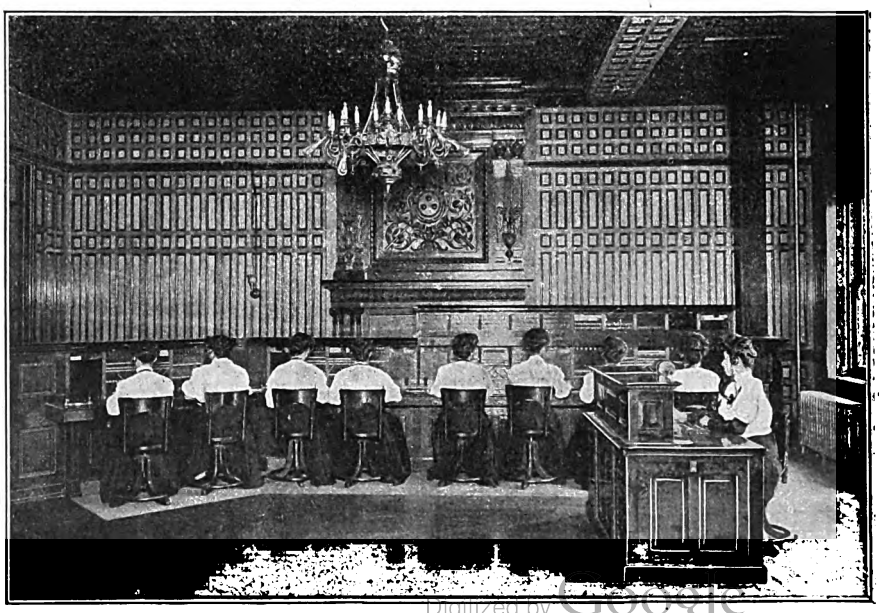
The terminal equipment is located on the second floor, in the rear of the building, and consists of a 6,400 capacity construction main, intermediate and relay frame; main frame equipped with 6,100 pairs of Cook's protectors.

The two-position wire chief's desk and power equipment, consisting of duplicate set Holtzer-Cabot current motor generator to operate on direct current power circuit, a ringing dynamotor to operate on 40-volt storage battery, and two busy-back and howler attachments are also in the same room.

Off the terminal room is a well ventilated storage battery room containing a duplicate set of 20 cells type G-27 Electric Storage Battery Company's accumulators equipped with G-15 elements.

The equipment also maintains a two-position monitor's desk and a single position chief operator's desk.

The new company has built twenty-five miles of new underground construction in addition to four miles that was originally installed in the old subway. This



Toll Board Equipment.

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construction required 800,000 duct feet of vitrified clay multiple duct conduit, which is encased in porcelain cement concrete of three inches on all sides. The manholes are of oblong shape and entirely concrete. The cable distribution throughout the business section within a mile radius of the exchange is entirely underground, consisting of 300 pair double wrapped paper lead cable of No. 22 B. & S. gauge copper, with an electrostatic capacity of .10 M. F. per mile and No. 20 B. & S. gauge is used for lines extending beyond the mile radius.

Interior of General Manager's Office.

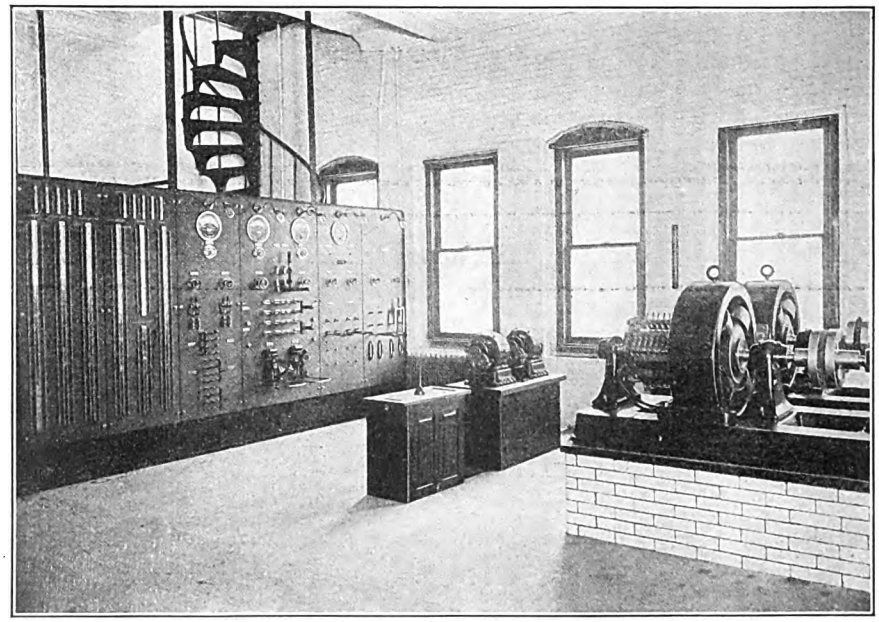
In this section, laterals are run from manholes in each block to the basements of the buildings, which does away with the unsightly distribution of poles. The economical advantages of an all-cable plant are admirably demonstrated in the residential section of Syracuse, where no cross arms or open wire construction appear. The cables are opened every third or fourth pole into 10-pairs terminal boxes and run from there with service wires to the houses. The maintenance of this type construction is considerably lower than open wire and cross arm construction, more liable to destruction by storms.

The toll line service has been an important branch of the new company's business since the construction of its several long lines in different directions, that connect with other companies operating in the states of New York and Pennsylvania. These lines are of standard construction, using 30-foot poles and No. 10 B. & S. gauge copper wires. Building 60 miles south to Lisle, where connection is made with the York State Telephone Company of Binghamton toll lines, they have an outlet to the southern part of the state and Pennsylvania. A similar line has been built east to Vernon, connecting with the Utica Home Telephone Company, giving service through to Albany and eastern parts of the state. The northern section of the state is reached through a new toll line built 45 miles to Pulaski, connecting with the lines of the Black River Telephone Company to Champlain, Watertown and other northern points. West to Elbridge, 16 miles, a line was extended to connect with the Auburn Telephone Company, Auburn, N. Y., and the toll line system of the Inter-Ocean Telephone Company of Buffalo permitting good service.

Throughout Oneida county, several small exchanges and farmers' lines have been installed connecting with the main exchange in Syracuse, some of which are at Tully, East Syracuse, Liverpool and Camillus.

September 25th the state convention of Independent telephone men of New York will be held in the building shown in the illustrations accompanying this article. The Independent Telephone Company of Syracuse is making arrangements to accommodate the visitors and give them the pleasure of inspecting the luxurious appointments of this building and its model telephone exchange equipment.

The description that has been attempted in this brief article falls far short in emphasizing the magnificence of the home occupied by the Syracuse Company. The entire equipment of the system was designed and planned for the installation in the splendid environment, unwittingly planned for it by Mr. Crouse. That the beauty of the interior fittings would naturally have a tendency to influence outside construction is everywhere apparent.



Power Equipment.

Independent telephone men should attend the New York State Independent Telephone Association for two reasons in particular—to perform important convention matters and to see the de luxe telephone system of America, if not of the world.

Are Your Rates High Enough to Make Your Investment Permanent?

By J. C. Kelsey

RECENT agitation over telephone franchises in Chicago and New York and the low rates that are being asked by applicants for these franchises suggest the subject I have chosen to write upon.

It not infrequently happens when a large city is approached for a franchise to operate a telephone exchange the applicants are unmindful of the ultimate station number, and the accompanying disagreeable feature of raising rates to meet the future growing condition.

Chicago and New York both furnish opportunity for 200,000 to 500,000 telephone stations. The investment to build these systems would be enormous, if the new interests anticipate plants whereby any applicant in these cities may have a telephone a week after the application has been received. No system should be contemplated without such thought in mind for months of dreary waiting on the part of the applicant cannot be considered a friendly asset.

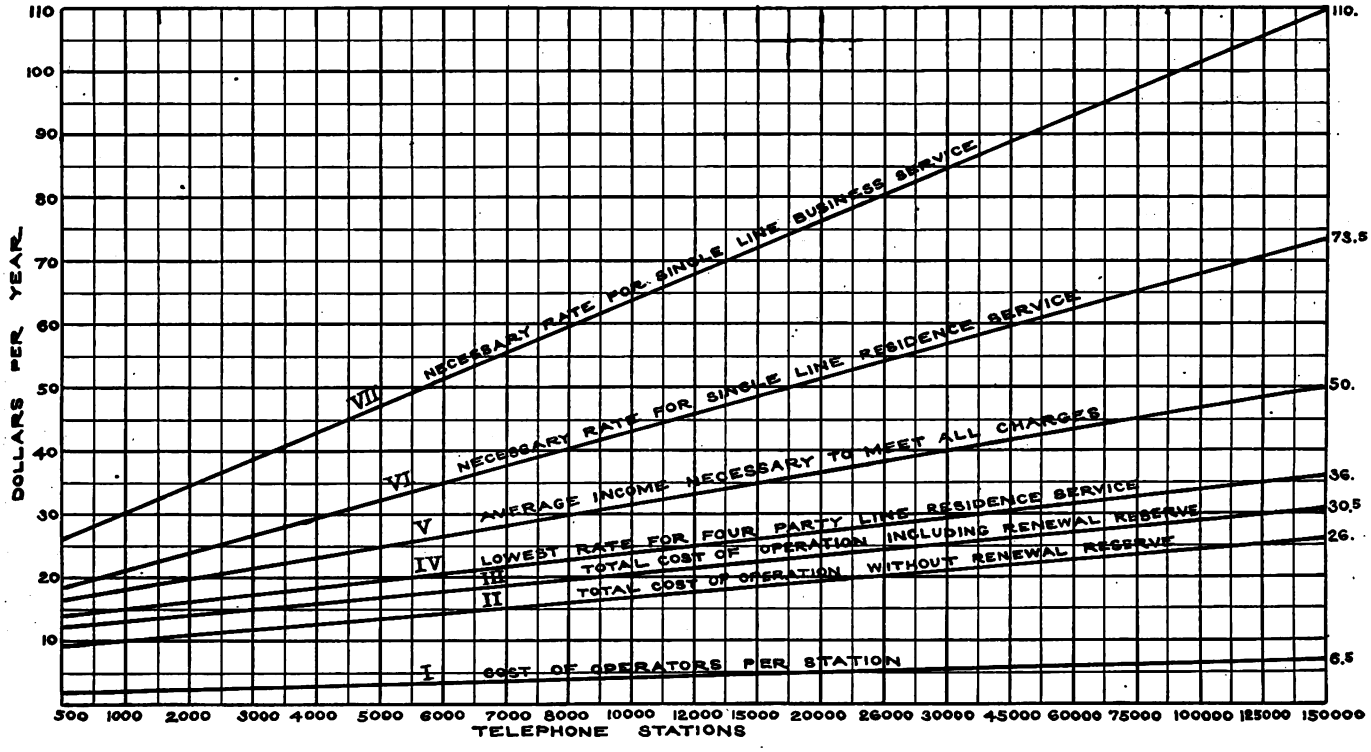
Whether manual or automatic, the results on the earning and disbursing sides of the ledger will be the same, and the penalty of low rates will be either a periodical rate-raising campaign, always discouraging and disagreeable, or the company will be obliged to float along on the verge of bankruptcy, depending upon the ability of some manufacturer to be the better banker in the management of the debts.

The accompanying diagram shows the various annual costs of operating exchanges of different sizes. The horizontal lines indicate dollars per year and the vertical lines show the number of stations in the exchange system. For example, to find the cost of girls per station in a 26,000-station system, follow the vertical line to Curve 1, and thence horizontally until you observe the figure of $5. For one thousand stations, you will follow the vertical line and cross Curve 1 on the $2 line.

These curves are all based upon the statements of operating systems and enough data has been used to evolve logical lines of expense running up to exchanges having 150,000 stations.

Curve 1 shows the increase in actual switchboard operating expenses as the system grows.

Curve 2 shows cost of operation in the various exchanges. In the 1,000-line exchange, it will be noted that the multiplication of the girl cost by five will give the total cost. In the 26,000-station exchange, the multiplication of the cost of girls by four will give the total cost.



Diagramatic Chart Showing Cost of Operating Telephone Exchanges.

Curve 3 shows the total cost of operation, plus a renewal reserve ranging from $3 in a thousand station system to $4.50 in a 150,000-station system. Even this item of renewal reserve is a constantly increasing factor.

Curve 4 shows the lowest rate you should consider to give four-party residence service.

Curve 5 shows the average income from each station required to defray all operating expense, maintain a cash renewal reserve and to pay 10 per cent dividends upon the actual investment.

Curve 6 shows the lowest single line residence rate permissible to help make out the necessary average income per telephone.

Curve 7 shows the lowest single line business rate permissible in order to maintain the necessary average income per telephone.

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According to Curve 1, the 1,000-line system shows a

girl cost of $2 per telephone. Curve 2 shows a cost of $10 per station, while Curve 3 totals the renewal reserve. This makes a total cost of $14 per station per year. The 10 per cent dividend, $5 more, or a total of $18 per year. To earn this income, the business rates should be $30, the single line residence rate $21, and the four-party residence rate $15.

The 2,000-station system shows girl cost at $2.20 and operating cost at $11. The renewal reserve makes it total $14 and the 10 per cent dividend provided increases the total to $20. To earn this income, the business rate should be $34, the single line residence rate $24, and the four-party rate $16. It is worth $18.

The 4,000-station system pays $3 for girls and $12.75 for operating. The renewal reserve brings the cost to $16 and the 10 per cent dividend raises the average income to $23.

In connection with this diagram, I propose to comment upon the condition at Indianapolis. I know of no more striking example which bears upon the question of increasing cost. When Mr. Sheerin, one of the most courageous pioneers, started the Independent movement over eight years ago, he figured upon an honest return upon the actual investment in the system. He asked for a $40 business rate, and a residence rate of $24. The average receipts of $30 at the 4,000-system point justified the rates asked, because there was a surplus which could go into extensions and improvements. This amount was practically 20 per cent of the gross receipts and everything flourished.

But Indianapolis took kindly to the Independent telephone. No one has the gift of prophecy and could forsee this. Besides at that time no one knew that increasing station lists required more money to operate.

At 12,000 stations, the ever increasing Indianapolis subscriber, because of the multiplicity of his calls, obliged the telephone company to pay the girls $4.50 per station, and the operating charges ran up to $18. The renewal reserve raised the cost to $21.50, and the necessary dividend increased the total cost to $33. To meet this average cost, the business rate will have to be $68, the single party residence rate $46, and the four-party residence rate $25. Surely service to 12,000 stations is worth every cent called for in these figures.

At 26,000 stations the cost of girls grows to be $5 per station. True to the rule, multiplying by four gives us the total cost of operation. Adding the renewal reserve charge, the expense totals $24. The dividend brings the amount up to $38. The rates necessary to meet this condition are $80 for business, $54 for single party residence and $30 for four-party residence service.

The curves lead to Chicago and its troubles. Those who live here and those who have been in the city know how artistically rotten the service is. We all know that it is a large system, and upon investigation we must know that a duplicate plant, put up in modern style and arranged to give every citizen telephone service when he wants it, could not be built for nearly twice the $14,000,000 capitalization of the Chicago Telephone Company.

This concern grew with the city, and, like all monopolies, it grew as it pleased. It has a record that no other utility service corporation can equal. It is despised not so much for its utter contemptibleness in treating with the public, but for the souls it has caused to be lost.

The city, with usual municipal stupidity, created a commission to learn the truth about the Chicago Telephone Company's methods. The most remarkable thing the commission developed was the fact that this big operating company had no way of knowing what its telephone service cost. The company's officials are about as competent as relationship to a Massachusetts directorate will allow. The American Telephone & Telegraph Company needs about 1,000 good Independent telephone men to aid in opening up the eyes of the blind old octopus.

Coming back from gossip to curves, let us take the vertical line leading from 150,000. The girls cost $6.50, and the total operating expense is $26. A renewal reserve of $4.50 per annum brings the total to $30.50. As a modern telephone plant would cost nearly $200 per station, 10 per cent for dividends, together with surplus account, would add $20 to the amount, making the average income of $50 per station necessary.

But the Chicago Telephone Company is only capitalized around $100 per station, hence $40.50 would be income enough if it was conducted on a truly honest basis. Only last year $10 per station must have gone into new construction, but the company does not admit it. Surface indications point to a mistake which seems to have confused the construction and maintenance accounts to the extent of about $1,500,000. But even at the worst, we should never fail to realize that the dear old mother company spends the money and keeps the books, too.

Now comes the more serious aspect of the Chicago situation. The Subway concern, with its present heavy load of indebtedness and inability to meet bond interest, proposing to construct a telephone system for all Chicago, and asking for a maximum rate of only $85 per station! This company, if it hopes to deal fairly in the matter, would have to equip 200,000 stations at the outset in order to beat down the competing effect of the Chicago Telephone Company, with its 150,000 stations, and it would cost $30,000,000, at least.

It is absolutely necessary to cover the city more completely than the present company if the new enterprise expects to get the upper hand. A small town can select its district, but today a successful new large city company must be complete or it will have a serious handicap.

The curve does not show figures for 200,000 stations, but any man who has studied telephone conditions will know that the line will not descend to fit such a contingency.

Any new company proposing to build a plant for Chicago will have to earn an average income per station of $50, and when one considers the great number of extension stations and private branch exchanges, it is easily apparent that the maximum business rate must be very near to $110, the single line residence rate to $73.50, and the four-party residence rate $36.

My deductions are based upon averages from dozens of exchanges ranging from 500 to 26,000 stations. Only in a few places is the business rate high enough to pay its share to the average income. I am very sure that the great majority of exchanges of given sizes have rates much under those given in curves 4, 6 and 7.

When you find such exchanges, you possibly see nothing wrong on the surface, yet a comparatively monstrous floating debt can be found if you will look for it. Of course, floating debts are all right, if you are a modern "captain of industry" and can convince the manufacturer and supply dealer with ample financial "backing."

The American people are tired of financial mismanagement. I believe that the day is not far distant when a default in stock dividends will send the management responsible for such condition to the penitentiary. If the law said hang the bank directors when the banks failed, there would be no bank failures. There has been some treacherous work done in cheating innocent stockholders in Bell companies, and there has also been some

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shameful work performed in certain Independent circles, but we hope to see no more business of this sort.

The current Indiana *Bulletin* says on its front page that telephone securities should be as good as government bonds. Heartily I agree. But they are not, and will not be until each company looks to its *far future*. The beauty of government securities lies in their permanency. Can a telephone company, paying out all of its earnings in dividends and maintaining no renewal reserve fund, be considered permanent? Not yet!

Everything reverts back to your income. Without sufficient income, you cannot maintain a cash renewal reserve, and you are stingy with service needs. You will inevitably accumulate a big floating debt, and it is not all chargeable to the capital account, either.

The world is crying for cheaper service and the companies are crying because it is already too cheap.

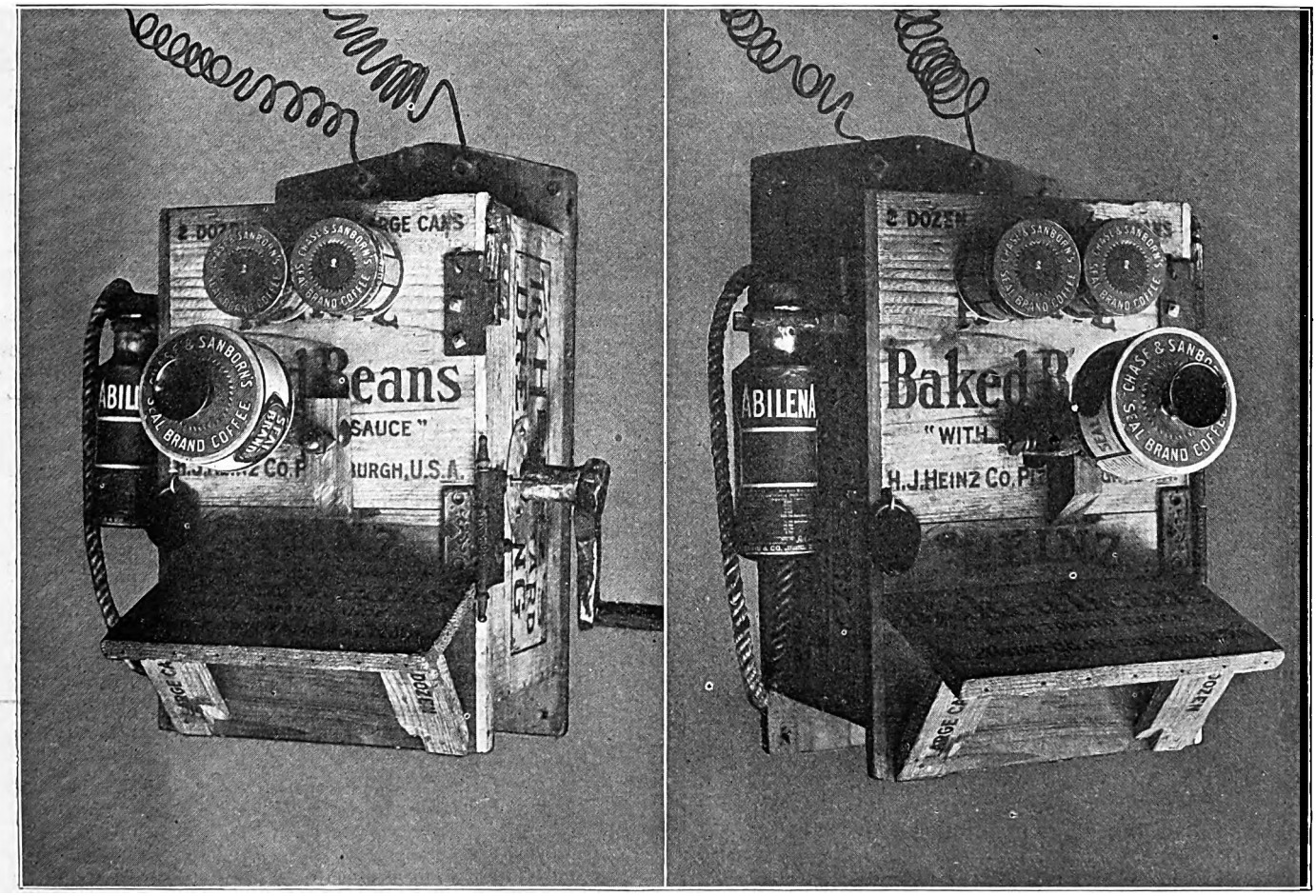
Telephone companies should not make a single extension in the way of construction that will not return a yearly gross income of at least 30 per cent of the outlay.

Mr. Manager, you are in a difficult business. I believe very few men in the telephone work fully appreciate the future possibilities and difficulties of telephone service. Do you count cost, Mr. Manager? Are you keeping your property in first-class condition? Do you keep books honestly? Remember that fooling yourself is dangerous. Are you maintaining a cash renewal reserve fund? Are you absolutely certain that your 30-year bonds will be worth 100 cents on the dollar at maturity? May the next five critical years find you and your property of the fit, because none but the fittest survive.

A Decidedly Unique Telephone

By Leonard Young

PROBABLY the most unique telephone that has ever been made for practical purposes has been designed and built by Mr. J. H. Martin, at present employed by the Emporial Telephone Company, Emporia, Kansas. The instrument is in service in the store room and work shop of that company's plant.



Two Views of a Freak Telephone. Showing Details of Construction.

The aim was to use standard apparatus, but to so conceal it, under the guise of familiar objects, making it a conspicuous object of admiration for the telephone man and a wonder for the layman.

The cabinet is a "baked bean" box and bears a name in large letters, suggestive of fifty-seven varieties. The line binding posts were taken from a guy clamp, and as nothing but standard parts are used in the entire construction a middle post is provided for a ground connection. There is also a lightning arrester composed of a hard rubber cup from an ancient transmitter. The hook switch lever is whittled from a "bodock" hedge limb, has a natural fork, and is a real dainty little thing, being only thirteen inches long and having two and three-quarter inches play, a piece of red painted tin as an escutcheon plate, presents a dressy effect.

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To answer a call, one apparently grasps a bottle of "Abilena Water" and places the large end to the ear. The receiver cord appears to be composed of a five-eighth inch rope, which disappears into the bottle stopper at one end and the telephone at the other.

A coffee can mounted upon a hedge arm serves as transmitter, and considering everything it is wonderful how far the coffee can will talk. The arm is held in place by a carriage bolt, and a coil spring on the bolt secured by a nut enables one to raise or lower the arm.

Two coffee cans mounted in the regulation place seem to act as ringer gongs; however, the regular gongs are covered by them.

To look at the generator crank reminds one of boyhood days down on the farm, when we used to turn the grindstone while father ground the axe. It is made of hedge, has a natural crook, and its general proportions and make-up suggests the old-time grindstone crank. The swing is about ten inches, the crank being five inches in length.

The door is secured by two mismated rusty hinges, which may have been taken from the proverbial cellar door.

These are fastened to the cabinet with a miscellaneous collection of bolts and screws, recalling memories of a junk shop.

The telephone is "fool proof," being safely and surely protected by a staple and padlock.

A metallic line composed of rusty barbed wire, probably confiscated from some honest farmer's fence, connects the instrument with a twisted pair to the switchboard.

The telephone is used many times a day, for both local and long distance messages. On a trial test, it was successfully used to Joplin, Mo., via Kansas City; also to Pueblo and Denver, Colo., the latter a distance of more than 600 miles.

The equipment of this instrument comprises Dean transmitter and receiver, Kellogg induction coil, Monarch hook switch, Western Electric generator, Stromberg-Carlson ringer, and Columbia dry cells.

Following are the rules for using this "freak," which are posted in a conspicuous place:

(1) The fee for using this telephone is seven cents in Chinese dollars, payable at midnight on the 39th of each two weeks.

(2) If you haven't the proper change, for goodness sake change your shirt or your manners.

(3) To ring central, grasp the crank firmly with both hands, then stand on your head, make a noise like a dill pickle, and give the crank seventeen turns with your left hind foot. Central will then say: "What number"? You will respond by repeating the Constitution of the United States, in a loud voice, through a megaphone. Central will then thank you kindly and give you the number you desire.

(4) Anybody succeeding in getting the telephone to work will be required to set 'em up to the crowd.

(5) We wish to give our patrons the best possible fire service, therefore in case of fire ring the towel, which can be located by inquiring of the chief keeper of the Royal Tar Soap.

(6) If, after ringing more than twenty-three times for central and failing to get a response, the subscriber shall cuss, he shall be excused. If he fails to cuss, after such provocation, he shall be severely disciplined.

(7) This is a "publick" telephone, but persons without good character will not be permitted to use it. The following individuals are on the black list: Theodore Roosevelt, Dr. Samuel Shuck, Sitting Bull, William Allen White, Harry Thaw, Harry Orchard, Emperor of Germany.

(8) Persons using this telephone after night will be required to furnish their own match to light the electric lamps so they can see to talk.

(9) Persons using rude language when talking to central will be referred to Dr. Samuel Montpelier Shuck, who will put them through a course of pure English, as taught in Arkansaw.

(10) Do not mar the varnish on the wood work or the nickel plating on the metal parts. Trouble men are also cautioned against using an axe, monkey wrench, crow bar and other surgical instruments in making repairs.

(11) Don't talk too long; a yard or two is long enough, if not too long.

(12) If you are hungry, help yourself to the currents, which can be found on all wires.

The two views accompanying this description are especially good and emphasize the claims of the maker that here is a telephone in a class by itself.

International Independent Telephone Association.

The present administration is pledged to a policy of strengthening the International organization in every way possible. It must depend upon and asks the co-operation of the affiliated associations in carrying out this purpose. Officers of these associations are therefore urged to begin district meetings without delay, and to take the necessary steps to eliminate any weak points in their organizations.

District Plan the Best.—Associations which have not already divided their territory into districts should arrange to do so at once. Experience has demonstrated the advantage of the district plan over all others.

To Get Results.—Whenever practicable, each association should engage some one to give its affairs exclusive attention in an official capacity. This method has been productive of splendid results wherever adopted.

Wanted—Statistics.—Each association should arrange to bring statistical information covering its territory right up to date, and report same promptly to the general office at Cleveland. This is important. Those who have not been giving the subject the attention it deserves should do so at once. Forms of blanks, reports, etc., to be used in gathering this data may be secured free upon request.

Committee on Litigation and Legislation.—After careful consideration your President has appointed the following Committee on Litigation and Legislation: Dwight E. Sapp, chairman, Mount Vernon, Ohio; A. L. Tetu, Portland, Ore.; Frank H. Woods, Lincoln, Neb.; J. B. Earle, Waco, Tex. All of these gentlemen are peculiarly qualified for taking care of the work which will devolve on their committee. They are all actively identified with large operating interests, and are well known to the Independent people everywhere as representative men. Your association is to be congratulated upon having secured their services.

Revised Constitution.—The constitution, as revised at the last convention, is being printed for distribution. Copy free upon request.

Financial Statement.—Apportionments by Executive Committee for 1907-8:

ASSOCIATIONS.	
Arkansas	$ 100.00
California	300.00
Canada	25.00
Illinois	750.00
Indiana	1,000.00
Iowa	700.00
Kansas	400.00

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Kentucky	200.00	
Maine	25.00	
Michigan	750.00	
Missouri	500.00	
Nebraska	350.00	
New York	300.00	
North Carolina	25.00	
Ohio	1,300.00	
Oregon	40.00	
Pennsylvania	500.00	
Texas	100.00	
Vermont and New Hampshire	25.00	
Virginia	50.00	
West Virgina	250.00	
Wisconsin	250.00	
		$7,940.00

CONTRIBUTIONS AND PLEDGES.

Swbd. and tel. mfrs.: Equipt. stamps.	$6,500.00	
Mag. tels. and drops.. $4,000.00		
C. B. tels. and drops.. 2,500.00		
Supply dealers and jobbers	5,000.00	
Engineers	250.00	
Journals	500.00	
Operating company (paid in July, 1907, $235)	750.00	
		$13,000.00

GENERAL.

Honorary membership fees (paid in 1907, $50)	$ 750.00	
Miscellaneous accounts	791.14	
		$1,541.14
Total		$22,481.14
Paid in		285.00
Balance to be collected		$22,196.14

Annual assessment 1c per unit. A unit is an operating telephone or a circuit mile of toll line. Assessments are payable monthly, and are based on number of units in respective associations at last convention.

FISCAL YEAR, 1906-7, CLOSED MAY 25.

Total receipts this year to date, including special committee, balance	$11,840.06	
Total expenditures, including accounts accrued before last convention...	10,838.05	
		$1,002.01
Accounts payable	$ 525.27	
Estimated expenses for next thirty days (publicity department not started)	325.00	
		850.27
Surplus, September 15th		$151.74

N. B.—The Association should have a fund of $1,500 per month for the next nine months for publicity purposes and $1,000 per month for strengthening and extending the organization. Nothing will be done by the present administration until necessary funds are pledged to defray the cost of the undertaking.

Long Distance Maps.—We can furnish maps of fourteen states, showing the Independent toll line development. The map of Ohio is printed, and will be sent postpaid upon receipt of 25 cents. Maps for the other states are in form of blue prints, and will be made up to order at a nominal charge to cover cost and postage. We can also furnish a blue print showing principal long distance connections from Atlantic coast west to central Nebraska.

Supply Department—Discontinuance Sale.—The stock of "shield" supplies is selling very rapidly. Get busy if you want to take advantage of the low prices prevailing. Price lists and full particulars free on request.

General Information Wanted.—If anything telephonically occurs within your range, inform the Cleveland office. Such as good openings for extending the Independent field, legal decisions affecting the business in any way, or anything that seems to you would be interesting. THEODORE GARY, *President.*

August 14, 1907.

The Telephone as a Safety Device.

Admiral H. N. Manney, U. S. N., who was one of the American representatives at the recent international conference on the subject of wireless telegraphy, is authority for the statement that since the adjournment of the conference, so much progress has been made in wireless telephony that it is now possible to communicate by telephone at sea over a distance of 30 miles. The system under which this remarkable achievement is possible is distinctly a marine system, as it would be more expensive and far less effective on land.

This demonstration of the efficiency of the telephone at sea, where no wires can be used, gives added interest to a recent statement of Nikola Tesla, the electrical expert, in a recent communication in the New York *Times* concerning the value of wireless signals on railroads and the superior utility of the telephone for such service. Mr. Tesla declares that "without question, the widest field of application for wireless telegraphy is the conveyance to moving trains of such information as is indispensable for keeping the traveler in touch with the world." He predicts that "in the near future a telegraph printer of news, a stock ticker, a telephone, and other kindred appliances will form parts of the regular wireless equipment of a railroad train."

But Tesla regards the telephone as the best possible safety contrivance for future railroading. He says that the railroads are rapidly adopting electric motor power, and thus placing themselves in position to take advantage of all sorts of signaling devices. In his opinion the telephone is the best of these, as it will enable the engineer or conductor of a train to call up any other train or any station along the track and obtain full and unmistakable information and thus reduce the liability to collision. He declares that public opinion should compel the adoption of this safeguard.

The telephone will undoubtedly come into use in the way suggested by Nikola Tesla. It has supplanted the old and crude methods of signaling in many industries, and has reduced the danger of accident very materially. In lumbering operations the loggers now string wires along the streams, and telephone to each other relative to the movement of the logs and the conditions of temporary log jams. This development of lumbering is reported chiefly from Maine, but loggers generally will be quick to adopt the telephone wherever the water conditions make logging precarious. The use of the field telephone by the Japanese in the recent war with Russia is a matter of common knowledge.

Telegraphone a Success.

After ten days of service, the new telegraph-telephone system recently installed by the Louisville & Nashville, known as the telegraphone, has been pronounced an unqualified success, and the line is now in full operation between New Orleans and Mobile, with connections at all the intermediate stations. In the operation of this system only one wire is employed in the transmission of both telegraph and telephone messages, which may be sent either interchangeably or simultaneously, without the slightest interruption or confusion. Now that the distance of 180 miles between New Orleans and Mobile has been successfully operated further extensions may soon be ordered and the system may be put in operation for a much longer stretch of territory. Another local road equipped with the same system is the New Orleans Terminal Company, which has employed it for some time past, and finds it most satisfactory.

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The Telepost

A Semi-Technical Description of the Delany System of High Speed Telegraphy

By Frederic B. Wright

PRIMITIVE man believed that all the forces of Nature were evil and antagonistic; implacable foes with whom he had to contend for his very life. In the centuries which have passed since he chipped his first flint, he has been gradually learning one great lesson—not entirely learned yet, impossible to be learned quickly—that his life depends not upon antagonism to natural laws, but in working in harmony with them, and, better yet, in setting them to work for him.

The first steps in any mechanic art are usually taken against the current of the law. Men see the object to be gained, and the obstacle in the way, and they either strive with brute strength to "buck" through in some fashion, or devise complicated methods of circumventing it. Then, in good time, comes one who sees that the very force itself which seemed antagonistic may be turned to account to accomplish the desired end, and from the very elements of defeat plucks victory. It is such a victory that Patrick P. Delany has won in the hotly and long contested field of automatic telegraphy. He has done more than bind the heretofore unruly "static" in chains; he has made it work in harness, put to use the very force that for years has been the lion in the path of high speed, commercially-practical telegraphy.

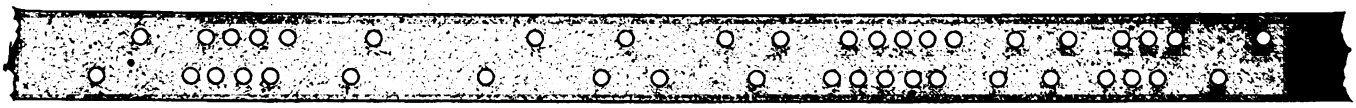

Figure 1—Perforated Tape Used for Transmitting Messages.

It is strange that in this the era of high speed automatic machinery there should be so few who realize that the ordinary telegraph lags far behind the standard of mankind's other servants, and that, as far as commercial capacity goes, it has improved hardly any since Morse first gave it to the world. It is particularly curious that it is here, in the country that gave it birth, that it is still generally employed in its orignal manually operated form, whereas its automatic, high speed form has until lately been carried forward by the inventors of Europe, and its most perfect service has been found there.

Machine or automatic telegraphy has never been popular in this country, partly from the manual skill of our operators, partly from prejudice, and partly from defects inherent in systems which in actual operation did not admit of rapidity or certainty even over comparatively short distances. There was a very large discrepancy between the theoretical or experimental speed and the actual working speed. Under the best and most favorable experimental conditions a speed of between 500 and 800 words per minute was possible; but under only extremely good working conditions, between New York and Chicago, the Wheatstone apparatus was only able to transmit some 75 words. This, however, compares favorably with the Morse transmission of a maximum of 50 words and an average of 15 words per minute.

There were two main reasons for the comparative failure of automatic telegraphy. One was the complicated and delicate construction of the instruments, and the other, and main reason, was the retardation in the transmission of the current wave or impulse. Theoretically an electric impulse travels along a line with a speed of 288,000 miles a second. Practically, and in actual working, the impulse is retarded by the electrical inertia of the line, and by the necessity of charging the line up to its certain capacity before a signal can be transmitted.

In all high speed telegraphy it is necessary to use automatic recording instruments, as the rate of signal transmission must of necessity be far more rapid than it would be possible for a human operator to receive. Prior to Mr. Delany's invention, however, all the recording instruments were open to the objection that the dots and dashes marked upon the receiving tape tended to run together and to become merged in one continuous line. These extensions of the signal marks are known as "tailings," the cause of them being that the line wire has not had time between the impulses to clear itself of the charge which produced the prior signal. This tendency to run together the marks varies in correspondence with the length of the line wire, its "capacity," and the electrical condition of the atmosphere or surroundings.

It will be seen, then, that long continuous lines, composed of relatively large and capacious wires, such as are necessary for rapid telegraphy over long distances, are peculiarly open to the troubles which would seemingly prevent the accomplishment of the thing striven for.

Figure 2—Receiving Tape, printed Electro-chemically.

While the use of double currents—that is, currents of opposite polarity sent into the line for each alternate signal—acts to decrease the tendency to "tailing," by wiping out the previous charge, yet it did not entirely prevent the mergence of the signal characters, due to electro-static "capacity" and inertia when the systems were operated at a high speed over long lines.

In such long continuous lines the effect of the impulse at one end is only very feebly manifested at the other, and not only is the manifestation feeble, but the surging of the current is relatively slow because of the inertia or "lag" of the line. When it is attempted to subject the electricity in the line to rapid oscillations

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and reversals, these oscillations run together, tread on each other's heels, as it were, and the resultant signals are jumbled and confused.

The feebleness of the current in long lines has led inventors to increase the delicacy of the detecting and recording instruments, but in proportion to that increased delicacy they have increased the liability of derangement of its mechanism, and made it so sensitive as to be easily acted upon by accidental fluctuations of line current—that is, to changes in the line brought about by stray currents, and induction from other lines, and even from passing clouds charged with electricity.

There are, then, two main difficulties to be overcome in the solution of long distance rapid telegraphy: First, a force at all times more or less constant in the line acting against the sending of current waves through it, and second, the weakness of the transmitted signal—a weakness which for practical reasons cannot be obviated by the use of delicate mechanism. In addition to these is the comparatively minor problem of sending the signal impulse mechanically. There is needed, then, high speed transmitting mechanism, a means for turning this supposed inimical force to account, and a receiving instrument which, while sensitive enough to record the weakest impulses, shall yet have no such delicate and finely adjusted mechanism as can be easily put out of order either through the high speed of its operation or by changes in the current. Let us see how Mr. Delany has solved these problems.

The main difficulty was with the "static" present at all times in the line. Here was a force going to waste, finding only mischief to do in its idleness, and Mr. Delany promptly set it to work as a message carrier—gives it a "push," as it were, and starts it off on its errand, while he, the operator, sits quietly down waiting for its return on the proper signal. He no longer tries to push past this "static," but to give it the push, or impulse, which shall compel it to do the work. And it follows from the taking of the "static" into partnership that he no longer fears its strength, but, on the contrary, desires the increase of that strength, and when it is not strong enough, increases it artificially. It will be seen from this how far-reaching the change made by Mr. Delany is, and how great the gap between his system and the system of his predecessors.

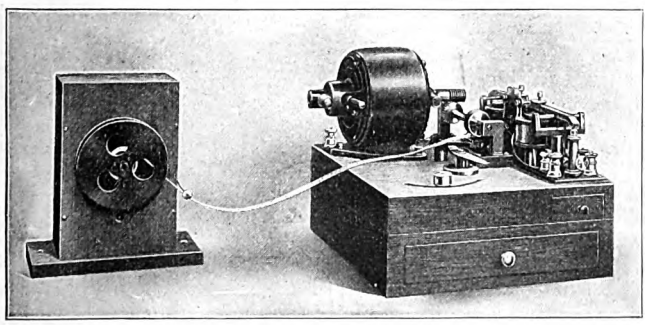

Figure 3—The Delany Perforator.

In its general outline the Delany "Telepost" system comprehends a tape-perforating system whereby the message is translated into arrangements of perforations corresponding to the dots and dashes of the Morse code, a transmitter through which the perforated tape is passed at a high speed, its perforations making and breaking contact between contact points, thus starting and reversing the movement of the static charge present in the line wire—a line wire of relatively great electrostatic capacity, and hence of high conductivity, and a receiver wherein the relatively feeble impulses make a chemical record of their arrival and duration.

The main element of the sending apparatus is the perforated tape which is shown in Figure 1. This is of paper, perforated with two rows of holes, one row near the upper edge and one near the lower. It will be seen that the upper and lower holes are not in alignment with each other, but that the upper perforations are in advance of the corresponding perforations in the lower row. The longitudinal distance between an upper and a lower perforation corresponds either with a dot or a

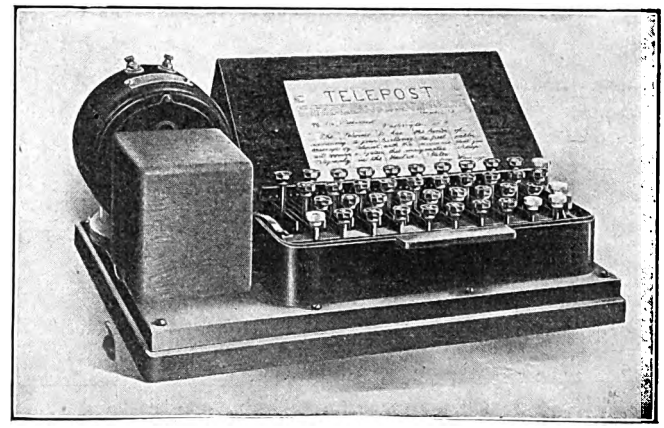

Figure 4—The Delany Keyboard.

dash. If the distance is short, a dot results; if long, a dash. The object of the primary perforation is to initiate an impulse—give the static charge a push, as before stated. The object of the secondary impulse is to reverse the polarity of the current.

To perforate the tape it is drawn beneath a pair of steel punches, each operated by an electro-magnet and controlled by a Morse key. A downward stroke of the key causes the primary punch to operate, and immediately spring up again so as to clear the swiftly moving paper strip. Upon the release of the key the secondary punch operates. Each operation of the key thus makes two punches in the strip, one on the lower edge and one on the upper, the initiating or primary perforation and the checking or secondary perforation. If the interval between these two perforations is short, the static charge flows in one direction only long enough to make a dot on the receiving tape; if long, to make a dash mark.

The perforator is shown in Figure 3, the punch-carrying mechanism and the magnets for operating it are shown on the right. The punched strip passes out between feed rolls operated by an electric motor, and is wound upon a removable reel shown on the left of the figure. The perforating mechanism may either be operated by a regular Morse key, by an automatic Morse key, or by the Delany keyboard shown in Figure 4.

This latter is a most ingenious mechanism, operated like a typewriter, and which translates the depression of a key into corresponding dot and dash contacts, there in turn operating on the perforating mechanism as before described. Each key is connected to a sliding bar on which all contact lugs are spaced properly so as to make the combination of long and short contacts corresponding to the letter of the key. These sliding bars are normally held out of engagement with a shaft driven by an electric motor. When a key is depressed, its bar is engaged by the shaft and carried forward, the contact lugs on its face making and breaking the current to the electro-magnets of the perforating mechanism. With this keyboard the sending tape can be perforated by any office typist unacquainted with telegraphy in the same

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manner that a telegram is written today, the tape sent to the station, from there transmitted mechanically at high speed to its destination, and all without the intermediation of any skilled operator except at the receiving station, and without the message being even seen by anyone except the last operator. This is of great importance in business telegrams, as is obvious.

The reel of perforated tape is placed on the transmitter, shown in Figure 5, and the strip guided between two upper contact fingers mutually connected to each other and to one side of the circuit, and two lower

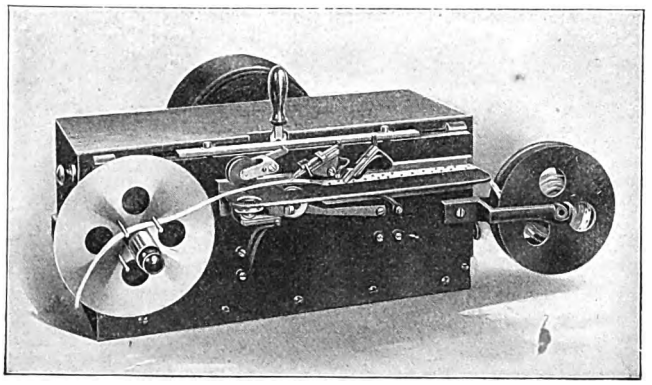

Figure 5—The Delany Transmitter.

contacts. One of the lower fingers is connected with the positive pole of a source of energy and the other with the negative pole and a variable resistance. The upper and lower fingers are separated by the tape except on the coincidence of a perforation when either the primary fingers contact and a positive impulse is given, or the negative or secondary fingers contact, giving a momentary negative or checking impulse.

At the receiving station is a chemical recorder, Figure 6, comprising in essence two fingers, one of platinum, the other of iron. The static charge, when a starting impulse is given, passes through the iron finger to the tape, where it makes a blue mark. (See Figure 2.) From the iron finger the current passes to the platinum stylus and so to the earth—the circuit being thus completed.

The tape in both the transmitter and recorder is drawn through the mechanism by feed rolls driven by electric motors, the paper strip being driven at a rate equal to 8,000 words a minute if desired. It may be here pointed out that there is no need of synchronism between the sending and receiving instruments. If the dots and dashes on the receiving strip are too short, the receiver is speeded up; if too long, it is speeded down. The receiving operator has this entirely at his own convenience.

The principle of the telepost system is to keep the line fully charged to its capacity at all times. Hence, when the primary contact is made by the positive finger of the sending instrument, a positive impulse passes from the source of energy. This impulse is but momentary, and ceases immediately, but the static charge set flowing by the primary impulse still continues to flow out at the receiving end, marking the moving strip until the polarity of the current is reversed, when the chemical action on the recording strip ceases immediately.

If the receiving operator sees that the record is not clearly marked he will know that the line has not sufficient "capacity," or static force, and that force must be added. This is done either by introducing condensers or by prolonging the discharge by retardation coils.

The physical results of Mr. Delany's invention are, first, the immediate transmission of signals over distances heretofore prohibitive of immediate transmission, and, second, the ability to use a recorder of the simplest possible mechanism, not composed of oscillating parts and therefore not limited by the possibilities of mechanical movement, nor liable to become disorganized and give way under the strain of rapid oscillation, yet having the maximum degree of sensitiveness.

The commercial and economic changes flowing from the adoption of the Delany system, and indicated by the new word "Telepost," are as far-reaching and as complete in this way as the changes in structure before described. Messages may now be sent mechanically at a speed of from 1,000 to 8,000 words a minute, a speed much higher than by any other method, and with a certainty of transmission not possible with other mechanisms. This means not only that messages will be sent at much lower toll rates, but at much lower cost. This decrease in operating expenses applies both to the actual cost of transmission and to the initial outlay for plant and the cost of maintenance. This for the reason that four wires under the Telepost system are equal in working power to sixty-eight wires of the system used today over practically the entire United States.

Under the Morse key system there must be a wire to each two operators. With the Telepost system one wire will transmit the work of forty pairs of operators. In other words, the work of forty operators busy translating messages into perforated Morse may be transmitted any distance at an average speed of 1,000 words a minute. The individual operator is busy for the same length of time as under the old system, but the line is not monopolized by him during that time, and is open to other operators. Under the old system it would take two operators one hundred minutes to send a fifteen-hundred word message, and for that hundred minutes the line would be closed to all others. By the Telepost

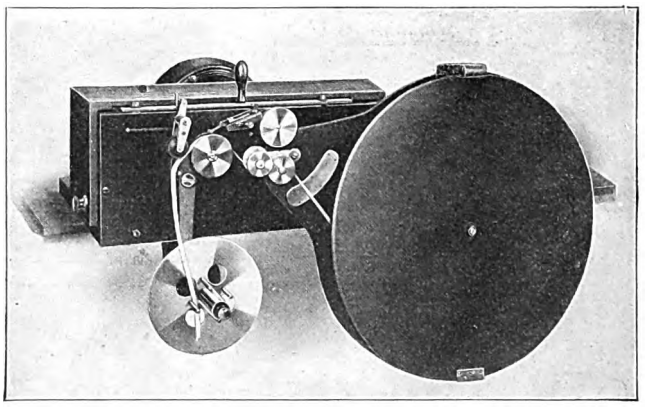

Figure 6—The Delany Receiver.

system it would take two operators 101½ minutes of actual working time, but the line would only be used by them one minute and a half.

Two Missouri Resolutions.

The stockholders of the Red Oak, Minert and Lockwood Telephone Company, of which G. W. Campbell, Red Oak, Missouri, is general manager, recently passed a resolution that no connection should be granted to persons connected with distilleries, saloons and immoral houses, and prohibiting the solicitation of business among such people. Another resolution reads as follows: "Resolved, That we do not connect with the Bell Telephone Company in any way whatever."

Some Questions Answered

By Arthur Bessey Smith

Instructor of Telephone Engineering, Purdue University.

Editor SOUND WAVES: I have read your answer to the query in the August SOUND WAVES about pocket voltmeters for battery testing and wonder where the Warner battery gauge comes in. I have been using one for several years, according to the plan suggested in the directions which came with it, which are the same as those you gave for pocket voltmeters. In the directions the statement was made that the Warner gauge does not indicate volts or amperes, but a sort of cross between the two. The thought has occurred to me that, when you apply the gauge to a cell for testing it there is a current flowing through it and that current must have some value. Can you tell me what it is?—T. C. C.

You are right, the Warner gauge does operate with current, and this current is expressible in amperes, though the numbers on the scale are arbitrary and do not refer to amperes or volts. I have made a test of a Warner gauge which had been in service for several years and was tested just as it was, without any special adjustment. The gauge was put in series with a standard milliammeter, battery and rheostat. With no current flowing, the rheostat was adjusted to a rather high resistance. The circuit was then closed and the current run up till the gauge indicated 5. The milliammeter was read, and the two figures recorded. The current was then run up to a value of 10 on the gauge, and the true current read again, recording as before. This was continued till the highest point on the scale, 50, was reached. The

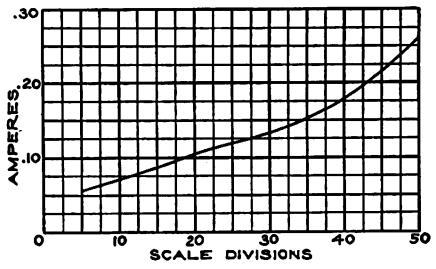

Figure 1.

current was then run somewhat above and then reduced till the gauge again indicated 50. On reading the current as shown by the milliammeter it was found that it was a little higher than before. The current was again reduced till the gauge showed 45 and the current read on the milliammeter. This was followed all the way down to zero. The table here given shows the results:

	TRUE CURRENT.		
Gauge.	Going up.	Going down.	Average.
5	.075 amp.	.04 amp.	.058 amp.
10	.075	.07	.072
15	.09	.08	.085
20	.12	.09	.105
25	.125	.11	.118
30	.14	.12	.13
35	.17	.14	.155
40	.18	.17	.175
45	.225	.21	.218
50	.28	.29	.285

The first and last columns have been plotted in the form of a curve, which appears in Figure 1. The scale of the gauge has been laid off on the horizontal line and the corresponding values in amperes plotted upward. The curve shows that the deflections are approximately proportional to current for a greater portion of the scale, but near the upper end each division represents more current. This is shown by the upward bend of the curve. A good new dry cell on this gauge indicated between 30 and 35, depending on the make of the cell. As the resistance of the gauge is 10 ohms, this is equivalent to saying that the cell would furnish between .13 and .155 ampere through 10 ohms. The figure for most new cells is 31, which means .135 ampere. The effective voltage of the cell would be 1.3 volts, which is found by multiplying the current by the resistance. The effective voltage for all scale values can be easily computed in like manner, so that if one desired, he could get an idea of both current and voltage of the cells tested.

Editor SOUND WAVES: Kindly advise me what to do to get rid of alternating current induction on one of our lines. The pole line is about eight miles long, and at the point where we are picking up the induction, consists of four pairs of trunk wires on the top arm and ten pairs of iron subscriber's wires on the second and third arms. About a mile from the starting point, the electric light company has a 2,200 volt alternating current circuit about five feet above our line for twenty-four poles and we cannot lower our line any further. The whole line is transposed with the regular transposition. We can get permission to transpose the electric light circuit if required, or we can transpose our lines as often as necessary. Kindly advise the best plan.—H. W. M.

There are telephone lines in successful operation on the same poles with three-phase power circuits carrying as high as 20,000 volts with the telephone lines not over seven feet away and transposed every six poles. From this it is evident that our first point of investigation must be to see that our telephone lines are in good condition. They must be perfectly insulated from the ground all the way and have no bad joints anywhere. Especially go after the toll lines and measure their resistance to earth, taking each wire separately. The voltmeter test is best for this. If the tip wire, when stripped of all apparatus, measures a million ohms to ground, the sleeve wire should measure the same or nearly so. Trim trees and go after all other sources of leakage till the lines are in the best shape possible. See to it that all connecting apparatus is free from grounds and that repeating coils are accessible to the cord circuits, in case you have to connect one of these toll lines to a line which is not in good order.

Each wire of a pair should have the same resistance. Test this by short circuiting the far end and putting it to ground. Then measure the resistance of each separately to earth, and compare. This is a rough test, as it includes the resistance of the earth. To eliminate it, make a third measurement from one wire to the other. If Line 1 is R_1 ohms to ground, Line 2 is R_2 ohms to ground, and R_3 across the pair, then the resistance of Line 1 alone will be

$$\text{Line } 1 = \frac{R_2 + R_3 - R_1}{2}$$

and

$$\text{Line } 2 = \frac{R_1 + R_3 - R_2}{2}$$

The result of a test as here described will throw much light on the case. Disconnect one of the toll lines from the switchboard by opening the line at the cable box where it goes into open wire. Disconnect it this way at both ends of the line, thus getting rid of all disturbances and leaks that may be in the offices or switchboards.

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Then listen on the line with a receiver and see how the noise is. Notice how it affects the noise when you reconnect each end into its office separately.

The following questions are suggestive in leading up to the correct solution of the trouble:

Are all of the lines on the pole line noisy?

Are they noisy all the time that current is on the electric light wires, or does the trouble come and go?

If the trouble comes and goes, under what conditions is the noise worst and when is it more quiet?

Are the lines more noisy when connected to certain other lines, or does it make little difference?

Of course you can transpose the power lines, but it should not have to be done.

Editor Sound Waves: I have read with interest the article in Sound Waves on the Roberts lock-out system, which appeared not long ago. There is one point which I would like to ask about, as it affects line construction. It seems that there are three lines coming into each subscriber's telephone. As I see it, this calls for three drop lines from the pole to the house. Is this true? It seems to me that this adds to the complication of party lines and makes it worse instead of better. If you can show where the advantage is, I shall be very much obliged.—N. T.

From a careful reading of the article in question it will be found that the Roberts system requires *four* drop lines to the substation, instead of two, as in the ordinary line. This fourth line, which was overlooked by the correspondent, is due to the unlocking coils, *C*. Referring to the June number of this paper, page 42, near the bottom of the first column will be found some statements about these coils and their position in the circuit. If there were no unlocking coils there would still have to be three drop lines, as it is necessary to bring the right line in, that it may be opened or closed by the relay. The other unlocking coil is placed in series in the left side of the circuit, which necessitates the fourth drop line. As to whether this added line construction is worth while is a point which can be settled only by the results of its practical application to commercial lines. That there is need for a good lockout system is evident from the large number of schemes that have been proposed from time to time. Most of them have either failed utterly when put to the test of commercial use, or have for some reason found but limited application. I have not seen the Roberts system in operation, but it seems to have good points. By many the point of having only one bell on the line at one time is greatly desired and will in a great measure offset the line construction. As the unlocking coils are differentially wound, and also of low resistance, they ought not to affect transmission so as to be noticed. There is an added reason for having the unlocking coils differential. If they were not, or if there were only one in each station, the talking current taken by the subscriber would tend to unlock the line and so shut off conversation as soon as it started. But as it is, one coil magnetizes the core of the relay opposing the effect of the other coil, so that no effect is produced.

Editor Sound Waves: We have been having some trouble in getting our soldering irons tinned thoroughly. They get very dirty and although we use sal ammoniac and rosin with solder in tinning, we are able to get only a small portion of the tip of the iron in good condition. Is there not some way in which we can get the whole point of the iron brightly tinned? If there is, I would like to know.—C. M. S.

Most of the work connected with running a soldering iron can be learned best by actual practice, but there are some points about soldering where one who has had some experience can smooth out the way for another. To begin with, it is very likely that your iron has been "burned," or overheated. Even if it has not been overheated, as an iron gets old it gets hard and will not take a tinned surface as well as when soft. Heat the iron till it is bright red, then plunge it in cold water and hold it there till it is black. This will take all the hardness out of it. This is exactly the process for *hardening* steel—it is well to remember the difference, for what hardens steel will soften copper. Then heat it again and hammer it on an anvil till you have put a suitable point on it. Do not make the point any sharper than you really need, for the point which is too sharp will overheat readily in regular use. Finish the pointing by filing the surface smooth with a large file. Get the entire surface which you desire to tin free from black spots and cavities.

Make up a solution of sal ammoniac about as strong as you do for carbon battery. This is a little less than saturated, giving the water all the sal ammoniac that it will dissolve and then adding a little more water. Have handy on the bench an old, damp rag, which you can use for wiping the iron. Also have some solder in the bar. For this purpose do not use rosin core solder or any wire solder which contains the flux. Heat the iron till it is a little less than red. Here practice is the best guide, for if you get the iron too hot it will tend to burn off the solder and get black again. If too cold, it will not take the solder at all. It must be remembered that what we are trying to do is to get the copper chemically clean and then secure a union between the solder and the copper. The proper temperature, as well as the proper flux, is of prime importance. I have found in my own work that by holding the iron about a certain distance from the face, so that the heat radiated from the iron can be felt, I can determine very well when the proper temperature has been secured. When the iron is heated to the right point, plunge it quickly into the sal ammoniac solution and out again, then apply it to the solder to melt some of it on the point and back again for another short plunge in the solution. If the iron has been in the fire for some time it may be necessary to file it a little just before putting it in the solution for the first time. If this first operation does not result in a satisfactory coat of solder on the point, repeat it as many times as necessary. Do not hold it in the solution any longer than you can help, as it will cool the iron too much. I have found the use of sal ammoniac in solution vastly superior to the dry form. While work is going on, keep the solution standing in a handy place and use it occasionally to keep the iron in good condition. On taking it from the fire, first wipe it on the damp rag, then give it a quick dip in the sal ammoniac, and you will be surprised to see how well your iron will work.

Editor Sound Waves: What are the names of the systems of automatic telephones which are now in operation? In the Strowger system, the call is built up on the decimal plan. That is, as I understand it, there must be 100 subscribers in a bunch, and ten bunches to make the larger group or thousand, and ten of these to make the largest group, and so on. Is this a necessary division? It seems that there are only ten trunks from one group to another. Is this the limit? Is it possible to work an automatic system with two line wires and no ground connection? In view of the limited amount of published matter on this subject I will appreciate an answer.—M. T. D.

Although the number of automatic systems which have been launched or invented and never launched is large, there are at the present time but three which call for any special mention. The Strowger system, with which I take it the correspondent is somewhat familiar; the Lattig & Goodrum system, and the Lorimer system. The Strowger system has been installed in many cities and is becoming pretty well known. The Lattig & Goodrum system is being introduced by the American Automatic Telephone Company, of Rochester, N. Y., and

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seems to have many good points. Their one plant of any commercial importance, at Ironton, Ohio, has been described in a previous number of this paper. It is a two-wire, common battery system, employing no ground connections. The Lorimer system has no plants in operation in the United States, although they have one at Peterborough, Canada, which is giving the best of satisfaction. All three of the above named systems are operative and capable of excellent results.

As to the necessity of a certain division of subscribers in an automatic system, it can be said that there is no fixed manner of division. In the Strowger system you are not limited to ten trunks per hundred subscribers. If the manufacturers chose to they could put many more contacts in the bank of the first selectors, or they can cut down the number of subscribers having access to a certain group of selectors. The decimal system may govern the call number which the user follows in whirling the dial, but the ratios of trunks is quite flexible.

In the Lattig & Goodrum system the subscribers are divided into groups of fifty each, and this is made the basis of the system. The motion of the switch is entirely rotary, and there are fifty contact points in the bank. There can be as many of these 50-groups in the exchange as necessary. The Lorimer system uses one hundred subscribers per group, the same as the Strowger.

Yes, it is possible to work an automatic system with but two wires and no ground. This amounts to one circuit, where the use of a ground return with a metallic line means in effect three circuits. The Lattig & Goodrum system does not employ the earth in any way for the selection of numbers. It has the advantage of simplifying the work of linemen, as it makes no difference if a pair is reversed.

Editor SOUND WAVES: What do you advise as the surest protection for cables? I mean from lightning, power current, and anything that comes along.—B. J. A.

In discussing the question of cable protection, people often get into the habit of considering the open wire line as the source of danger. In the case of lightning it is undoubtedly true that the open wires are the collectors which bring the lightning into the cable. But as the correspondent has indicated, there are worse things than lightning. Against heavy current there is no one thing which will give absolute protection, because there may be crosses from the power circuit directly to the sheath, in which case the protection in the terminal box will not be in a position to do any good. Against this class of accidents there is but one protection, *foresight*. Carefully inspect the pole line and see if there are any places where a cross might possibly occur between your cable and power lines. It will not do to satisfy yourself with mere safety from the power lines themselves, but all guys should be critically examined for the possibility of their forming a roundabout path for the foreign current. It will sometimes take quite a little study to assure yourself of the conditions, but the time will be well spent if it prevents future disaster.

Now, as to troubles which come in over the open wire line, the same observation holds true. Lines can be so run as to make the danger of crosses with power lines very small. But on account of the great number of these wires, as compared with cables, the danger of crosses is greater and should have efficient protection. Against lightning the carbon block arrester is doubtless the best. On account of the trouble which it sometimes gives by clogging, there has been a tendency on the part of some to restrict the carbon block arrester to the main distributing frame at central. It is true that it should be there, and it will in a great measure take care of the lightning. But in seeking a point of discharge the lightning must come all the way from the terminal box through the cable to the office. It may find a convenient place somewhere on the way and spark to the sheath, making an internal ground, which is one of the most difficult to locate. For this reason I should most certainly call for carbon block arresters at the end of the cable.

But the open space cut-out will not handle power current, as the latter jumps the gap and maintains an arc which quickly destroys the terminal apparatus. To avoid this catastrophe it is best to insert a fuse in such a position that the excessive current will blow it before any damage has been done. Figure 2 shows the way many people arrange the protection. The heat coil and

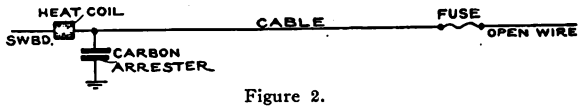

Figure 2.

carbon block arrester are placed at central, and only a fuse at the end of the cable toward the open wire line. The fuse is made of sufficient capacity not to be melted by lightning, but when trolley or other heavy current comes in on the open wire line it will flow through the fuse, cable wire and carbon block gap to earth, and in so doing melt the fuse and free the line. This works very well on short cables, where the resistance of the wire is low enough not to be much of an item, but on long cables and with leakage current from power lines which may not be of very great intensity, there is considerable danger to the cable wires from following this practice. It is far better to arrange it as shown in Figure 3, which is the addition of a carbon block arrester at the point

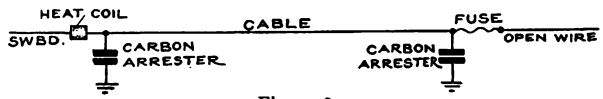

Figure 3.

between the fuse and the cable. This allows high tension current to find its way to earth without going through the cable, and gives better chance for the fuse to be blown without subjecting the cable to undue stresses.

The air gap in the arrester at the end of the cable may be a little greater than in the one at central, so that it will not become clogged so often. The fuse should be between two and three amperes capacity. A one ampere fuse is too likely to be blown by lightning, while a three ampere may in some cases be not sensitive enough.

Editor SOUND WAVES: We have had some trouble from bees which have made their home in one of our cable boxes. It is a wooden box and is about twenty-five feet from the ground. The pole is stepped. How can we get the bees without damaging the apparatus?—E. R. L.

One way is to smoke the bees out at night with sulphur smoke. Borrow a bellows from a bee man, such as is used for smoking bees, and load it with smoldering paper or cloth, which has some pulverized sulphur in it. Stop up all holes except the one through which you wish to force in the smoke, and one other to let out the air. The man who does the smoking must be properly protected.

Another way is to open the box in daylight and burn them out. If the box is closed, as many are, it will not be hard to climb part way up the pole and with a long stick push up the iron bar which holds the door and get it open. An old broom may now be prepared by wrapping several layers of old cloth around it and stuffing it rather full of sulphur. Pour on enough kerosene oil

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and light it. Climb the pole again till the burning broom throws its smoke up under the box, and it will quickly drive the bees out. It will kill a large number of them.

There are probably other ways of getting rid of bees in cable boxes with which our readers are familiar. We shall be glad to hear from any one who has experience or ideas on this subject.

Editor SOUND WAVES: We are having considerable trouble with cross-talk in our exchange. Please advise us about the inclosed sketch. The cross-talk is very bad indeed. We are certain as to the right side of cable wire going to ground, etc., and all joints are carefully made. Return wire is free from grounds and these wires will connect with our metallic lines O. K. The cross-talk is always there, no matter what connections are up. We try to operate this lead common return, because of its length and the trouble with large trees. Have no transpositions at all. —C. A. D.

From the tone of your letter I take it that the lines are all metallic in the cable, being on the common return only in the open wire part, which is about three-quarters of a mile. See Figure 4. If this is the case I would suggest that you make a few tests along the following line:

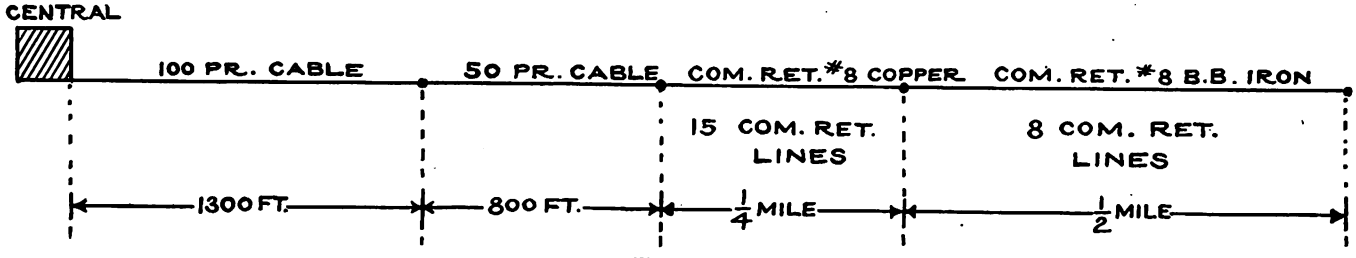

Figure 4.

Select several lines which are noted for their cross talk and open them at the end of the cable, leaving the cable end connected to the common return, as in Figure 5. Test both ways for cross talk, using as a test set one of your regular telephones. If the static capacity of your cable is high, say .12 M. F. per mile, you ought to get some cross talk in the 2,100 feet, but if other conditions are normal, it should not be objectionable to people who are used to ground or common return exchanges.

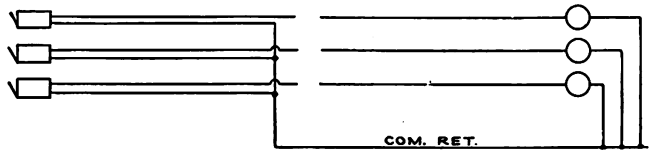

Figure 5.

If the cable shows up with too much cross talk, test it for insulation from one wire to another. The best means is a voltmeter, not one of these ordinary battery voltmeters, but a Pignolet, Weston, Whitney, American, or some other instrument which has at least 50 to 100 ohms per volt of scale.

If E = voltage of battery as read by the voltmeter,
e = reading of voltmeter, when connected to cable in series with the battery,
R = resistance of voltmeter,
x = resistance between wires in cable, then

$$X = R\left(\frac{E - e}{e}\right)$$

If you cannot get the use of a voltmeter, use a good receiver in series with two fresh dry cells and notice the click. Try it first on some cable which you know is good and clear from leaks. Then compare the loudness of clicks on the good cable with that of the cable under test. Avoid being misled by the first click, which is due to the static capacity and will occur in the best cable. It should very nearly vanish on repeated tappings.

Your insulation resistance in the cable should not fall below a million ohms.

If the open wire end of the lines shows up with the most of the cross talk, you will need to examine them. If possible, test them for insulation the same as the cable. There is not enough static capacity in the three-quarters of a mile of open wire to cause serious cross talk, so we must look either to the insulation of the lines from each other or to bad joints between the main return and the branch returns.

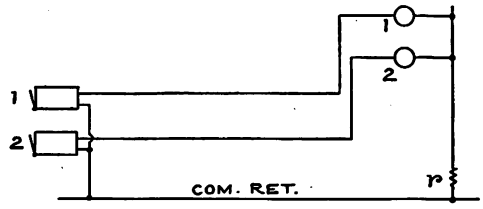

Figure 6.

From your mention of trees I judge that they are somewhat in the way. If they are, there is a possibility of the branches causing partial crosses between the lines. A test with the voltmeter or receiver will show this up.

When cross talk comes from poor joints in the returns, its action may be shown by reference to Figure 6. *W* is the main common return, *a* is a branch from the main return and supplies the two subscribers, 1 and 2. Let *r* be the small resistance introduced by a poor joint. Under this condition the return may not be the easiest path for the current returning from No. 1, so part of the current will go through No. 2. A little study will make this point clear. Your work may have been very thoroughly done, but in making joints between iron and copper there is great danger of subsequent corrosion unless thoroughly soldered. I am not certain that it is safe to depend too much on test clamps in the return, if it carries more than one subscriber.

These tests should show the location and cause of the trouble. However, a common return system will have a certain amount of cross talk no matter how perfect it may be.

Editor SOUND WAVES: Can you tell me how to wire up a common door bell so as to work on a closed circuit burglar alarm system? I do not want to have to rewind the bell, which is the ordinary vibrating kind. Also is there any way to fix up a burglar alarm system so that tying the wires together will give the alarm the same as if they are cut? Please answer with circuits in SOUND WAVES.—T. S.

The first requirement of the correspondent is very easily met, and necessitates only a simple change in the bell itself. Referring to Figure 7, the bell is seen to consist of two parts, electrically, in series. These are the coils and the make-and-break piece, the latter mounted on the armature. At the point between the coils and

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make-and-break piece attach a wire and run it out to a third binding post, *M*. Use window contacts which are closed when the window is down. If you have more than one window to protect, put them in series, so that the raising of any one of them will break the circuit. Wire the circuit as shown in Figure 7. It will be noticed that the circuit to the windows acts as a short on the make-and-break piece. Therefore the bell cannot vibrate, but remains pulled up all the time. But if the window circuit is broken, either by raising a window or cutting the wire, the short is removed, the armature falls back, and

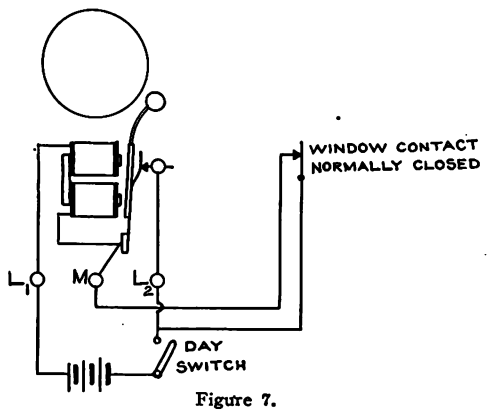

Figure 7.

the bell begins to operate as an ordinary vibrator. Of course, some form of closed circuit battery must be used.

The second proposition is not as easy, but by the use of two relays, beside the bell, it can be accomplished. Figure 8 shows how it is wired. The differential relay, R_1, has two equal windings, so connected that if equal currents flow in them from the center point, the core will not be magnetized enough to pull up the armature. The right hand branch of the circuit, containing the window and the 5 ohm resistance, should be equal in resistance to the left hand branch, which contains only the relay, R_2. If this is the case, the differential relay will not be energized and the bell will not ring, since R_2 is pulled up. If the window is raised, or the wire cut, the current in the right hand coil of R_1 will fail, the left hand coil will cause the armature to pull up, closing the bell circuit

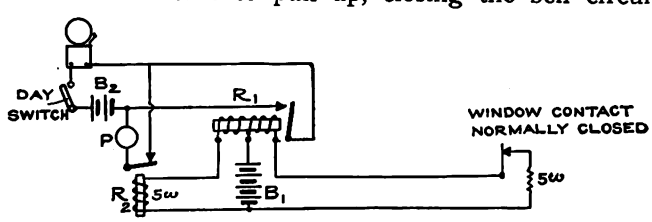

Figure 8.

and giving the alarm. On the contrary, if the wires to the window are short circuited, the current in that branch will become so much greater than the current in the left hand branch that the relay will be pulled up and the alarm given. B_1 must be some kind of closed circuit battery, while B_2 should be dry cells. If for any cause the closed circuit battery should run down, R_2 will fall back and close the bell circuit, so that notice will be had that something is wrong. If desired, an annunciator can be inserted at *P*, which will indicate that the trouble is in the battery, and not burglars. This might be a very satisfying piece of information to a householder, especially if the battery chose to run down in the small hours of the night. If a person did not care for this automatic notification of battery failure, the relay R_2 could be replaced by a 5-ohm resistance, and the rest of the advantages of the circuit would be retained. But since closed circuit battery is more likely to give out than open circuit battery, the relay should be installed. This combination makes a very safe and dependable alarm.

Editor SOUND WAVES: Being a subscriber of your valuable paper, I would be pleased if you would give me some information pertaining to generator troubles. I have a five-bar generator that seems to be shorted; it gives out no current whatever and turns hard. It seems to be at the end of the armature shaft as nearly as I can locate it. By taking off two or three of the bars it turns pretty easily. Is there any way of putting in a new terminal on the end of the armature shaft? I will be pleased for any information on generator troubles. Please answer in your next paper.—E. I. H.

The correspondent has taken a very good way to show the probable location of his generator trouble when he removed the magnets. The fact that he gets no current whatever, the crank turns hard, but turns easily when the magnets are taken off, points to a heavy short circuit in the winding. Since one end of the coil is permanently attached to the shaft for the purpose of carrying

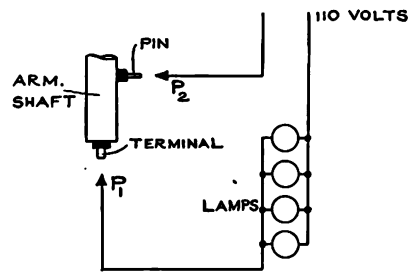

Figure 9.

out the current, this short circuit is most likely a ground in the terminal wire in the end of the shaft. To test it for sure, cut the coil loose from the little pin to which it is attached and test the pin and terminal wire for insulation from the shaft. If it shows up grounded, you can either burn it out or remove the terminal.

If you have 110 volt electric lighting current where you can use it, wire up a circuit like Figure 9, using several 16 C. P. lamps in parallel to prevent excessive flow of current. Touch the free wires P_1 and P_2 to the terminal and the pin respectively, and notice how the lamps act. If they burn steadily, your ground is a bad one and your current is not strong enough to burn it out. Turn on more lamps. If on touching the wires again the lamps flash up and then go out, it is likely that you have cleared the trouble. Take one of the wires off, wait a moment, then try it again. Shake the armature around and test again. This method often is successful, and should be tried, as it may save the work of taking the terminal out.

In taking out the terminal to clear the ground, it is

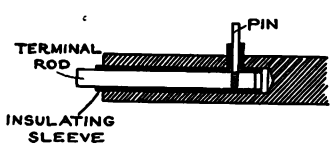

Figure 10.

well to notice how it was put in. Figure 10 shows how some manufacturers do it. The hole is drilled in the end of the shaft, another hole being drilled into the side of the shaft to give entrance to the pin. An insulating sleeve is then driven into the longitudinal hole and the terminal rod driven into the sleeve. The pin is then screwed into a threaded hole in the terminal rod and a short piece of insulating tubing slipped over it to keep it from touching the sides of the hole. Perhaps a more common way is

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that shown in Figure 11. Here the pin is replaced by a wire which is soldered into a hole in the end of the rod before the latter is put into place. The wire is straight, except for a bend near the end, which allows the assembler to work it out through its hole in the side of the shaft.

Try unscrewing the wire first. If it is put in as in Figure 11 it will do no more than to twist off. Then get good hold of the terminal rod and try to pull it out. It may come hard, so be careful not to mar it in your first

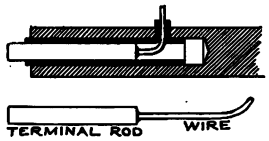

Figure 11.

attempts. Once out you can find by inspection what gave the trouble, and remedy it. It may often be a few filings or metal chips, or a sliver; or it may be that oil has worked in from the bearing and saturated the insulation. In the latter case you will need to clean the insulation thoroughly and perhaps dry it out. If these means fail the armature will need to be sent to the maker.

EDITOR SOUND WAVES: We have a case of trouble on a telephone line which is on the same poles with high tension power wires. If you will give us a few suggestions in your query column we shall be very much obliged. Inclosed find a diagram of the arrangement of lines. *C* is a switching point. No. 1 connected to No. 3 is quiet, also No. 2 and No. 3, but when we connect all three together it is too noisy to talk. The lines have been all right until a short time ago. The lines are all clear of grounds of all kinds. No. 1 is about 24 inches from the high tension lines and No. 2 is about four feet. They are transposed every ten poles. Would like to know the cause, if possible, and a remedy.—E. S.

Troubles on telephone lines which are close to high tension power lines are difficult to prescribe for at a distance. It is necessary to be on the ground and make personal tests as to their action and to find the exact details of their condition. In many lines the distance between the telephone and power lines is not constant, often varying from one to seven feet, but the transpositions are nearly always at regularly spaced intervals. If one transposition section is quite near the high tension line, and the next is somewhat farther away, the second will not be as strongly

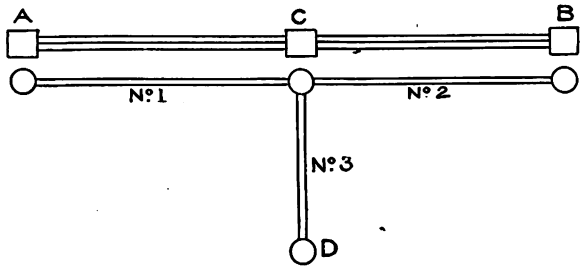

Figure 12.

influenced as the first. Although they may be of equal length in feet, one will not balance the other and there will be a tendency to noise. In a whole line such as No. 1 or No. 2 (Figure 12) the total unbalanced effect might not be enough to interfere with speech, if all conditions are perfect. So that if No. 1 or No. 2 be connected separately to No. 3, and No. 3 is in good condition, the result may be quiet enough to allow conversation. But suppose that when the three lines are connected together the unbalanced sides of No. 1 and No. 2 are connected together, the combined induction of the two may be strong enough to make the lines very noisy. This works in the following manner: All the lines possess capacity to earth. If there is any unbalancing between the two sides of the lines that are directly under the disturbing influence, they will discharge into this leg which runs away from the disturbance, *i. e.*, No. 3. If No. 1 and No. 2 are connected so that the strong side of one is with the weak side of the other, they will tend to neutralize each other, but if they are connected strong to strong they will aid each other in sending quite a strong discharge out into No. 3. This may be tested by reversing either No. 1 or No. 2 at the switching point, *C*. But do not reverse both.

Then there is always the possibility of some looseness in the connection at *C*. This would depend on the nature of the switching apparatus, which was not stated.

A remedy which is nearly always successful is to insert a good ring-through repeating coil in No. 3 at *C*. This greatly reduces the capacity effect of No. 3, although there will still be a little, due to the capacity between the two windings of the coil.

NOTE: I desire to call attention to some errors which occurred in the August number of this paper. In the query department, page 129, every division sign should be changed to a plus sign. As they stand, the formulæ are very misleading. The error is due to the stenographer's attempt to make a plus sign by using the hyphen, apostrophe and period in combination. Also in the last expression in the first column on the same page the numerator of the fraction within the parentheses has been omitted. It should be

$$p = \frac{1}{2}\left(\frac{G}{r} + 1\right)$$

the *G* having been left out.

Telephones in Mexico.

Within the next six weeks the Mexican Central will have another copper telegraph and telephone wire stretched between Aguascalientes and this city. The new wire will be used both for the telegraph service and for the telegraphone, which is now installed at Aguascalientes. The longest circuit in the world for these instruments is now, and for some time has been, in use on the Mexican Central between Jimenez and Juarez. It is 350 miles long and daily conversation is carried on between these points and with Chihuahua by means of the telegraphone. The company is making plans to in stall the instruments on all its trains on the Chihuahua division so that in emergencies the conductors of a train can talk with headquarters. At several other points along the line the instruments will be installed in the near future, and it is thought that under the merger all the trunk lines of Mexico will be equipped with the ingenious appliance.

Heavy Work Finished in Omaha.

The heavy conduit work of the Independent Telephone Company is completed, the job involving the laying of about 750,000 duct feet, or 122 miles. The work of placing the cables in the conduits is now in progress. In installing these conduits, it has been necessary to remove about 500,000 cubic yards of earth.

More than 3,200 poles have been set. The company has 514 men on its pay-roll on outside construction, and has already expended $130,000 on labor, aside from the work on its new buildings.

The two buildings will cost about $75,000 and are just about half completed. The second floor of the main exchange and the first floor of the branch exchange are ready for the switchboards. The contract for the installation of the switchboards limits the work to sixty days.

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Success of Concrete Poles

By Perry J. Freeman

THE continued demand for cedar poles so far exceeds their production that a substitute for pole leads, whether from the point of economy or otherwise, has had considerable fascination for construction engineers. A patent has recently been granted to Mr. William M. Bailey of Richmond, Ind., covering reinforced concrete poles, which has peculiar interest along this line. After much study and a series of tests, Mr. Bailey has demonstrated beyond all doubt that his invention will not only meet, but promises to surpass some of the requirements and claims established for cedar.

Mr. Bailey's patents have been assigned to the American Concrete Pole Company, of Richmond, whose intentions are not only to construct concrete poles under contract, but to sell the right to construct to other companies and users on a small royalty basis, or to sell the right to certain territory.

With the reinforcement of electro carbon twisted rods and spiral binding wires properly distributed in the column of cement, the poles are not only substantial and durable, but remarkable elasticity is displayed. For instance, a pole thirty feet in length will permit a deflection of thirty inches before the cement cracks. To obtain this result would require one-third greater horizontal strain at the top than would be sufficient to destroy a cedar pole of the same dimensions.

Even then the cracking of the cement does not impair the strength of the pole in the least, for after this takes place the reinforcement becomes active and takes the entire strain, and as the special rods are guaranteed to withstand a breaking strain of fifty thousand pounds per square inch, it is an easy matter to understand why this class of construction has two or three times the strength of cedar. The facts developed by these remarkable tests emphasize the surprising feature that they were not adopted long ago.

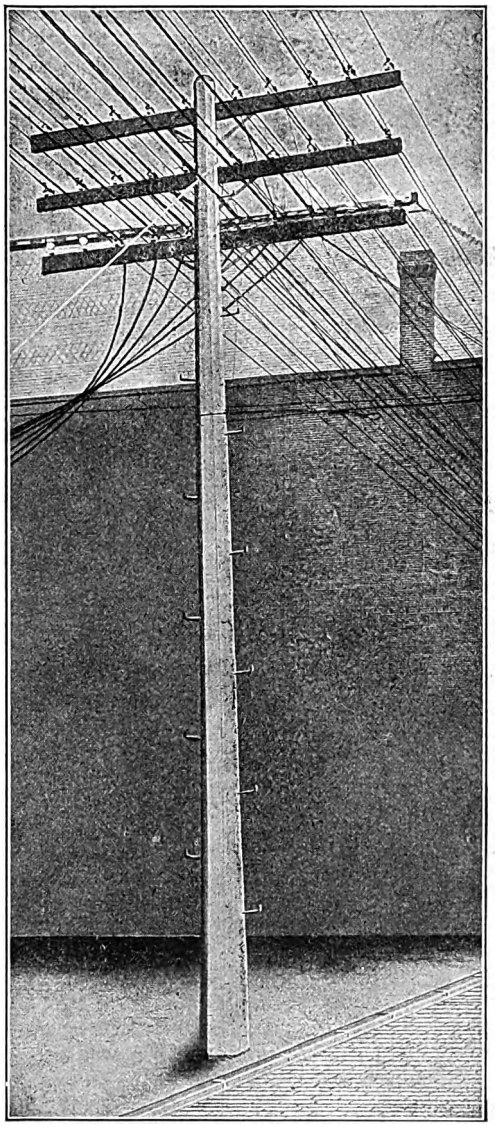

Figure 1.

As will be seen by the accompanying illustrations, the poles are square, with the corners beveled off two or three inches, so that the top of the pole is octagonal in shape. This not only gives it a handsome appearance, but leaves the corners substantial and avoids a sharp edge that would be liable to chip off.

The rods are placed within three-quarters of an inch of the surface of the cement at the corners and are then bound together by a spiral wire encircling the four rods from top to bottom. This not only serves to tie the rods together, but prevents danger of the cement shearing off, as the rods have a tendency outward when the pole is subjected to a lateral strain. Another important function performed by the spiral binding wire is that it ties the concrete together and increases the flexibility of the entire body.

The smaller poles, up to and including thirty-five feet in height, are molded lying on the ground, and after they have been seasoned are set in place by means of a gin pole. The forms are laid with the butt near the hole and the reinforcement placed. Then the concrete is poured in and allowed to remain three to seven days, according to the weather. The forms are then removed, so that they can be used again, and the pole is left to season. This process requires about three or four weeks, and the poles are then ready to be set and used. All poles should be built on the ground upright in the hole or in position to be set up, thus saving the cost of hauling or unnecessary handling, as this would increase the cost. Poles forty feet in length and larger should be built standing, as this is the most economical method. First, the hole is dug and then the form is set in place directly over it and lined up straight and perpendicular, temporarily guyed so as to hold its position. The spiral binding wires are then put in place and the rods drawn up on the inside of the form and set. After the reinforcement has been properly secured, the side of the form that was left out to receive the steel work is put in place and the bands or ties around the outside secured. The equipment is then ready to receive the concrete.

There are several methods of placing this material. One is by using a large bucket with pulleys and a horse. By this method, a fifty-foot pole can be filled in about two hours, including the mixing of the concrete. The most economical plan, however, is to have a wagon equipped for the purpose with a gasoline engine, concrete mixer and grain elevator. With this equipment, the material can be placed as rapidly as it can be mixed. The American Concrete Pole Company is now building wagons for the handling of concrete and concrete poles.

Some of the advantages of concrete pole construction may be summed up as follows:

The depreciation fund is relieved and can be spent for other improvements or go to pay dividends. It is said that underground construction is like diamonds, ever increasing instead of decreasing in value. This can also be said of concrete poles, as it is an undisputed fact that

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concrete improves with age. This has been most thoroughly demonstrated by the pyramids of Egypt. As the United States reports show that from $15,000,000 to $16,000,000 is being annually expended to take care of pole depreciation, it is time to stop and consider how this can be avoided.

Concrete poles are permanent instead of temporary, as is the case with cedar, and are not subject to destruction by birds and insects.

Every pole is a lightning rod and not only protects itself from being shattered by lightning, but is a safe

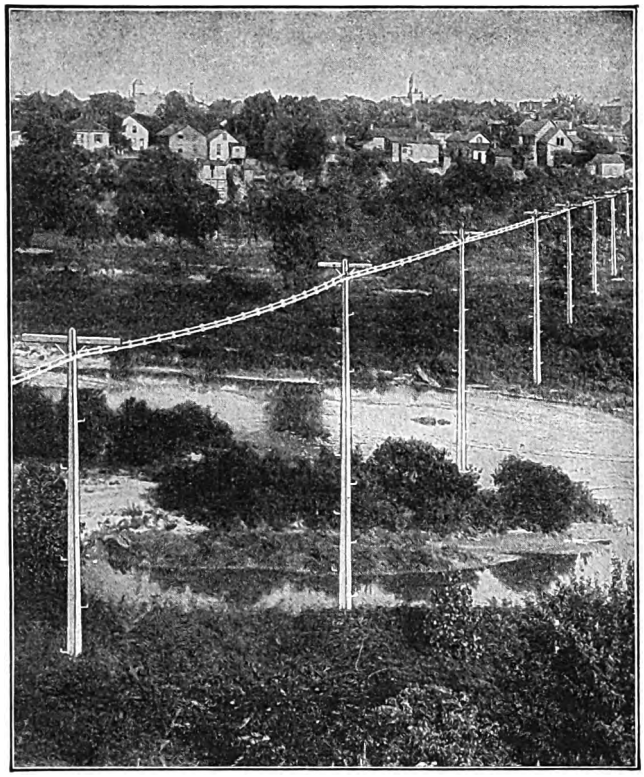

Figure 2.

guard to instruments and machinery at both ends of the line; as the major portion of the lightning will be conducted to the ground through the steel reinforcement.

Concrete poles are stronger and less liable to flaws and are not subject to decay, therefore the danger of valuable property being destroyed by wind, sleet and fire is materially reduced, if not wholly eliminated.

One of the important points in favor of permanent cement pole construction is that it dispenses with the necessity of replacing poles. It is well known that in placing a wooden pole, the cost of the pole is a small item compared to the expense of labor necessary to make the change.

The cost of painting required in cities to beautify and preserve poles is eliminated. The concrete pole presents a more pleasing appearance and is therefore less objectionable to city officials and the general public.

Self-supporting poles can be constructed to take care of any and all strains at places where it is impossible to secure anchorage.

The cost of dressing, framing, roofing, boring and stepping is dispensed with and pole yards are no longer necessary.

Figure 1 shows the Bailey pole in detail, two years old, which has been subject to all kinds of strain.

The lead of poles constructed across Whitewater River at Richmond is shown in Figure 2. The poles are from forty to sixty feet in length and were built in a perpendicular position. It is needless to say that this piece of work is permanent.

In Figure 3, Nos. 1, 2, 3, 4, 5 and 6, give the detail construction of the pole and reinforcement. No. 1 shows the four electro carbon rods as they are placed in the cement body, with the spiral binding wires pulled in place. No. 2 shows the general view and shape of cement body as finished, the steps and other bolts and holes are very easily made, while the concrete is plastic. No. 3, 4, and 5 show cross-section of pole with three different methods of binding; also two different methods of reinforcing. The scheme represented in No. 4 is only intended for extremely heavy construction. No. 6 gives a detail method of the manner of securing cross arms. A bolt, or rod, is placed in the form and removed within 24 hours after the concrete has been placed. This becomes a clean hole through which the bolt that is intended to hold the cross arm can be placed and the arm securely bolted on.

No. 7 represents the top, or roof of the pole. This is easily put on after the pole is finished, but is not necessary except for appearance.

After the forms are assembled and put in place they are wound in the proper manner to receive the rods. After the rods have been drawn in, the binding wire is stretched from bottom to top, which gives a tie around the rods about every four inches. The rods are then spread and placed and after the form has been secured, the concrete is poured in and allowed to harden. After

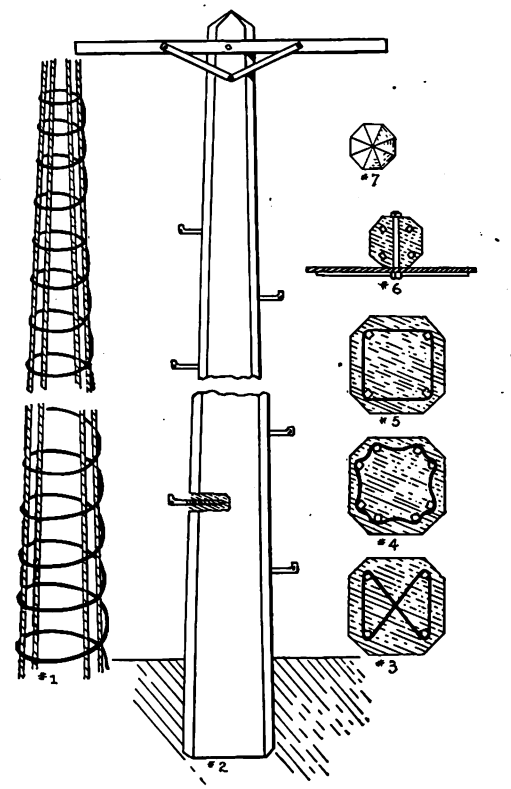

Figure 3.

three or four days, the forms can be removed and the pole left to season. About three weeks' time is required before it will be ready for use.

Mr. Bailey has made application for patents on forms varying in sections from five to fifteen feet each and divided up so as to be easily handled.

A man to be effective should be loaded with opinions as a six shooter with bullets, but neither should be discharged without good and sufficient cause.

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Wireless Telegraph in Practice

By George Rice

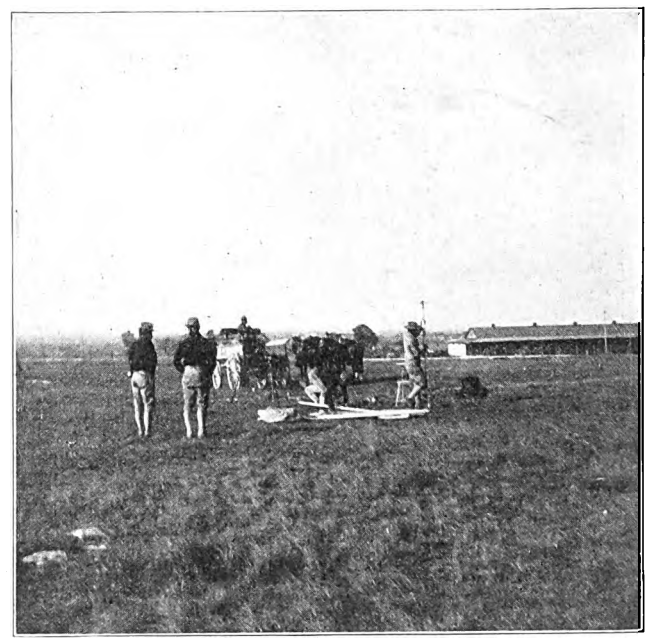
ONE of the most interesting new things at Camp Columbia, Cuba, is the regular drill of the wireless telegraph corps. The system has only recently been added to the otherwise complete equipment and the apparatus is light and portable for rapid installation in field service.

"Here comes the wireless! Gangway!"

These expressions may be heard nearly every day at this famous camp, and the "gangway" is respectfully observed, for the drill is entrancing. In the beginning, the start was usually made a thousand yards away from a given point and the "run," maneuvering, installing and establishing of the apparatus for actual work covered a period of approximately ten minutes.

As time passed, and the men and horses became better trained, the time for getting things into order for sending and receiving messages was cut down to nine minutes; then it was reduced to eight minutes and finally cut down to a fraction under seven minutes. This is considered good time and requires speedy horses or mules on the vehicle.

Ready for the Start.



Putting Up the First Joints.

The officers and some of the men are mounted and the outfit looks all the world like a fire company running to a fire, especially when the reel is used. Both reel and flat wagons are used for the wire. The signal is given and the company starts.

Having done the same thing many times before, there is no break at any point. The eyes of men and animals are directed toward the goal. Perhaps the company is competing with some other company, as occurred last field day, in which the two companies got their poles up to receive and send messages in a little over six minutes. And everything was in perfect order, too. There can be no slipshod work. The entire apparatus must be in shape to handle messages, and a miss at any point means that the thing must be done over again. Hence, at first, the organizations had to make a number of startes before a final finish could be recorded.

The most interesting point is where the pole is to go up. You stand there and watch for the signal as it is given up the field where the officer sits upon his horse with watch in hand. The minute hand designates the time. The order forward is given and the entire expedition moves at a gallop. The wheels of the vehicles strike upturned sod and rocks and the occupants are tossed about. Two ride on the rear step of the wire wagon and you see a picture of what very closely resembles a hose wagon going to a fire. There is the driver on the seat, whip in hand, urging the steeds on to full pace. A steady gallop is taken over the obstructions. This is a part of the business. It is not expected that the vehicles of the wireless outfit will be provided with smooth, hard roads in war. When a battle is in progress there will be ditches and other obstructions to go over, hence the run is made over a rough field, and when the cross roads are struck, the depressions along the edges give the wheels a jump and the men on the wagon learn the art of holding on or else they get tossed overboard.

The horses, too, seem to take a keen interest in the game. Both mules and horses are used and the faithful animals remind you of the fire horses. It is indeed an inspiring sight to see the expedition advance. There is no shouting. Everyone knows his business. It all goes like clock work. At the point selected for the station the officer gives a few commands. There is no confusion. The men jump to their places. The sergeant coolly directs. The officer oversees the work in general, and before one is aware of it there are several men running out to the four points of an imaginary square with the guy wires, while others are building up the pole by the use of the metal joints.

It is quite necessary that every member of the signal corps be trained in mechanics. It would not do to jumble the thing by improperly handling the joints. The sockets fit one within the other, similar to a jointed

fishing rod, and you can fairly see the pole grow. When the pole reaches a stage where the men cannot balance it readily, the guy wires are hooked on and the four men at the ends of the guys steady it. As the pole keeps growing higher and higher another line of guys are required to prevent the flexible pole from bending or collapsing, therefore the guy wire men drive stakes and hitch the wire upon them. Then another series of wires are fixed for the steadying of the pole at another section, and so on, until the pole is completely up. All this is done in seconds of time. The pole goes up joint by joint at a never-slackening speed until the terminus is attained. Another man comes into action quickly with the bicycle generator. This is a complete bicycle frame so designed that it can be quickly placed in position on the sod or roadbed. The machine is removed from the wagon, dropped down in position and properly connected. In another second or two the man who propels the pedals is in the seat; thus the generator is operated. A belt runs from a driving wheel of the bicycle to the pulley of the motor, and the necessary electrical current is generated.

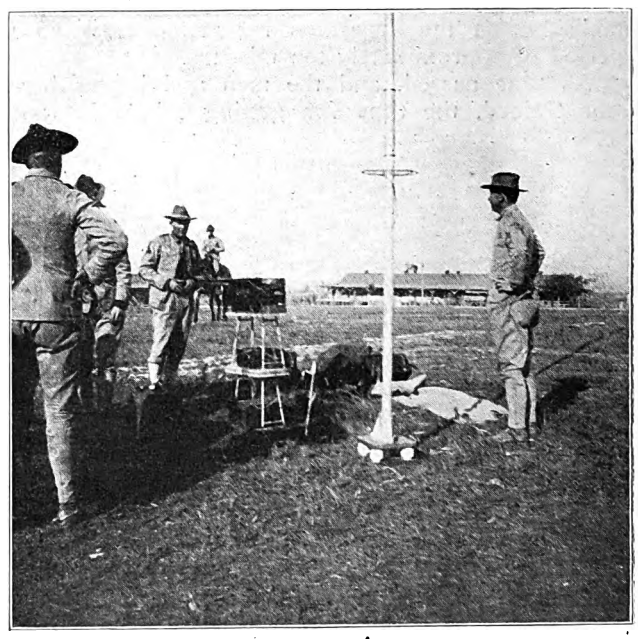
Generating the Current.

The beauty lies in the completeness and uniformity of the entire operation. I watched the tests a number of times. There was no lagging. The pole was never thrown out of balance. It always went up straight and sure.

The drill illustrates the result of continuous practice. A green crew of men could smash up the entire outfit if they attempted such speed. The trained soldiers make haste because they are drilled how to do so. A false move on the part of one man would put the thing off. If one of the guy men dropped his wire at the wrong time the pole might go over and the game would be lost, but this does not happen. Every man is trained to have his wits about him, just as the firemen are trained in their ladder work. So the pole goes up. The white metal joints seem to quiver and you are inclined to be ready for the dodging act, but the pole does not fall. Before you have time to think, some one calls a halt, because the devices for receiving or sending the messages have been put into complete service. Everyone stands still. The haste of the few moments before is followed by a lull. The pole is up; the connection is made, and the officer is in readiness to receive a message in the event there is one floating in space somewhere, or he can send one, if that is the intention. There is nothing further. The trick is done.

Of course, the whole thing must come down, and all must be made ready for the next run. Perhaps a sham battle wages. Then the order comes to move to another point. The men are trained to take down the equipment under fire. A man may get hit. All of these various conditions are taken into consideration. In actual warfare, first aid to the injured packages will be carried in each man's belt. Provision is made for duplicate parts in the event of breakage.

The entire apparatus is kept in careful order. Upon taking the parts down, each piece is put in readiness for a new run. The apparatus is arranged so as to get into action as soon as possible, and the signal corps



Ready for Receiving or Sending Messages.

men have adopted the same ideas of firemen in the run of the wireless. Upon returning to the home station, the vehicles are backed in, the horses stabled for the quick hitch and various other measures are taken for the next hurried get-away.

Glass Telegraph Poles.

Consular Agent Gustav C. Kothe, of Cassel, an agency of the Frankfort consulate, states that an architect of that city has been granted patents in Germany and other European countries and also in the United States for an invention for the manufacturing of glass telegraph and telephone poles. Mr. Kothe writes:

"A stock company has been organized and a factory for the manufacturing of glass poles has been built at Grossalmerode, a town near this city. The glass mass of which the poles are made is strengthened by interlacing and intertwining with strong wire threads.

"One of the principal advantages of these poles would be their use in tropical countries, where wooden poles are soon destroyed by the ravages of insects and where climatical influences are ruinous to wood. The selling price of the poles has not been fixed yet, but the company is willing to accept 25 marks ($6) for a pole of the length of 7 meters (about 23 feet). The Imperial Post Department, which has control of the telegraph and telephone lines in this country, has ordered the use of these glass poles on one of their tracts.

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Convention of Canadian Independents

THE second annual convention of the Canadian Independent Telephone Association was held in the City Hall at Toronto, September 4, 1907, and was attended by more than sixty delegates from widely scattered parts of the Dominion. President Alpheus Hoover, Green River, Ont., occupied the chair.

The report of Secretary A. F. Wilson, of Markham, showed a great increase in the number of subscribers to the various companies, and in the number of new organizations perfected and operating, and a large number in process of formation. Following is the report in full:

The association has every reason to be congratulated on the results of the work during the past year, not only in the increase of subscribers to the various companies, but also in the number of new organizations perfected and operating, and a large number in process of formation.

In addition to a vast amount of correspondence, the officers of the association have traveled largely throughout Ontario assisting local people in the formation of public opinion, and aiding in the formation of companies. The president and Doctor Demers assisted Mr. Dagger in the Manitoba campaign last winter, and contributed in large measure to the great popular victory over the would-be telephone monopolist.

In Quebec, the Bellechasse Company obtained favorable legislation from the government, and also obtained a satisfactory franchise from the city of Quebec, the first city of over 50,000 in Canada to try a live competitive system. The other Quebec companies report rapid progress.

In Ontario, progress has been most satisfactory and in considerable areas in the province, the Independents have left the Bell far behind. The greatest difficulty met with has been in towns and cities where the councils have, against the wish of the citizens generally, granted a five years' monopoly with the Bell. We might remind the public that under the laws of Ontario, permission is given to municipal councils to grant a monopoly to a telephone company. A monopoly can not be given to any company other than the Bell, and no municipality can give a monopoly in any other matter over which it has jurisdiction. Not only that, in no other province of the Dominion and in no state of the American Union can this monopoly be granted.

So far the development has been greatest in the counties adjacent to Lakes Erie and Ontario, and in New Ontario, but the movement is spreading generally. Nearly every company's report shows rapid growth in subscribers, many doubling in the year. Most of the systems have been brought up to standard both in equipment and outside construction, so that there are only a few single wire systems remaining. From the West, where Manitoba and Alberta have decided on government systems, and Saskatchewan, where the matter is under investigation, reports are very satisfactory; local companies and municipalities preparing to go ahead as quickly as conditions permit.

The forms sent out by the secretary, not having been all returned yet, it is impossible to give complete figures, but judging from the reports just to hand, and the latest previous reports, we have every reason to believe that there are now from 18,000 to 20,000 non-Bell or Independent telephone subscribers in Canada, nearly all the result of less than three years, against about 90,000 of the Bell, the result of twenty-five years.

To show the advantages to the public of the Independent telephone movement and of competition, we give several counties in Ontario. Elgin county, outside of St. Thomas, where there still exists the exclusive franchise, there is a population of about 29,000, Bell telephones about 200, Independents over 650. Haldimand population 19,200, Bell 133, Independents 400 installed and over 450 orders. Parts of York and Ontario, population about 16,000, Bell about 160, Independents about 600. Halton, population 18,400, Bell 300, no competition. Peel population 19,900, Bell 200, no competition. These figures speak for themselves.

Ald. T. L. Church, of Toronto, addressed the convention briefly with reference to the city's petition to the Ontario legislature last session, asking that similar steps be taken by the Ontario government to those adopted by the Manitoba government looking to governmental control of long-distance telephones and municipal operation by local lines. A campaign of education had been deemed advisable by the government before submitting the matter to a vote of the people, but Alderman Church urged the convention to adopt a resolution strengthening the city's hands in demanding a plebiscite at next municipal elections.

The entire proceedings were marked by an extraordinary degree of unanimity, and the following resolutions were adopted without a dissenting vote:

EXCLUSIVE CONNECTIONS.

"That whereas the Bell Company has attempted to coerce all companies to sign contracts precluding such companies from connecting with any other person or company, and from competition with the Bell Company,

"And whereas such clauses stifle competition and entrench the Bell in monopoly, besides being used to break up Independent inter-connection,

"Therefore, be it resolved that the action taken by the officers of the association in protesting to the board of railway commissioners of Canada against the ratification of such contracts and requesting the right to be heard in opposition to such proceedings, be approved, and the president be authorized to take such action as may seem to him to be advisable in the circumstances.

OFFICERS OF ASSOCIATION.

"Resolved, that no member, who is either directly or indirectly connected with a telephone manufacturing or supply company, or firm, shall be eligible to hold office in this association; nor shall the official headquarters of this association be located upon the premises of any telephone manufacturing or supply house.

EMBLEM.

"That the emblem (a maple leaf) selected by the executive committee be approved; and all Independent companies are urged to use the same on all their printed matter, while it is hoped that subscribers will adopt the words 'Independent Telephone in their letter headings.

GOVERNMENT OWNERSHIP.

"That whereas the time is opportune for the government of Ontario to take over the long-distance lines; and whereas the city council of Toronto has already petitioned the provincial government to this end,

"Therefore, be it resolved, that this association hereby endorses the above action, and would urge upon the government the holding of a plebiscite at our next municipal election in order to ascertain the voice of the people on this subject, and that a delegation be appointed to wait on the government in regard to this matter.

BELL CONNECTIONS.

"That whereas the Bell Telephone Company is proposing long-distance connection to local Independent companies in various parts of Canada, and is offering in consideration therefor to abandon the local field in certain sections, and whereas it is of the opinion of this convention that any such connection is bound to injure the Independent telephone cause as a whole.

"Therefore, be it resolved that this association frowns upon and denounces any such affiliation or connection of Independent telephone companies with the Bell Company anywhere in Canada as being injurious to the people as a whole; and that this association endorses the action of the International Independent Telephone Association, held in Chicago, on June 4 of this year, in respect to such arrangements."

George R. Bidwell, New York, who controls the New York Electric Lines Company, addressed the association in the afternoon, with reference to the urgent need for Independent telephones in New York. With a population of 4,000,000 in Greater New York the Bell Company, he stated, has less than 150,000 actual telephones. New York was behind the times in telephony just as in street cars, where horse cars with oil lamps are still in use.

Mr. Bidwell intimated that the Conduit Company, being controlled by the Bell Company, prevented any advantage resulting from an Independent company having a franchise, as all wires had to go underground, but Mayor McClellan's ambition was to have the conduits owned by the city before his term of office expires.

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Francis Dagger, who is investigating conditions and prospects for government ownership of telephones in Saskatchewan, and whose efforts were largely instrumental in the success of the campaign in Manitoba, expressed his belief that the municipalities should control their local exchanges, whether they owned them or not, that being left to the individual municipalities to decide. He was not personally in favor of the government owning local exchanges. The feeling was very general throughout the country for public ownership of the long-distance lines. Saskatchewan, he said, wants to develop the telephone system, so as to give every farmer a service at a reasonable rate. The government might have to build long-distance lines.

The following officers were elected: President, Dr. J. F. Demers, Levis, Que.; vice-president, Dr. W. Doan, Harrietsville; secretary-treasurer, F. Page Wilson, Toronto; executive committee, Dr. E. Hart, Brantford; Dr. Anthony Ochs, Hespeler; A. D. Bruce, Gormley; C. Skinner, Sherbrooke; F. Dagger, Regina, Sask.; L. Moyer, Beamsville; J. Dyke, Fort William; T. R. Mayberry, Ingersoll; G. W. Jones, Clarke; auditors, C. B. Adams, Harrietsville, and Dr. F. A. Dales, Stouffville.

The new president, before taking his office, spoke as follows: I feel much pleasure with the reception you tendered me when I walked over to this chair. When I look about this room I quickly find that I am the only French Canadian present, and I am talking to persons that in many cases can not understand my native language. But I suppose if I am your unanimous choice, you knew all that in advance and you did not expect from your president very much in the way of speeches in the future, and that you expect that your president will be more a worker than a talker, and on this head then I will feel more easy and I understand that good intelligent work is the common language of everybody in this room. Before taking the chair, I think I am in order in saying a few words on the good work and efforts made by our ex-president, Mr. Hoover, and by A. F. Wilson, the retiring secretary. I have been in good relations with all the officers, and am pleased to recognize that in all the different circumstances under which I met these gentlemen, I always found them working the best they could for the success of our organization. The success of this organization depends on the means that you provide to your board for their work.

It was strongly recommended that a permanent secretary be appointed to take up the general work of organization, and to promote all interests connected with the Independent telephone movement, and that the executive officers lend their assistance as far as this was possible in their own localities.

The convention adjourned to meet next year during the second week of the electrical exhibition, and arrangements will probably be made for holding the meeting where exhibits of manufacturers may be displayed.

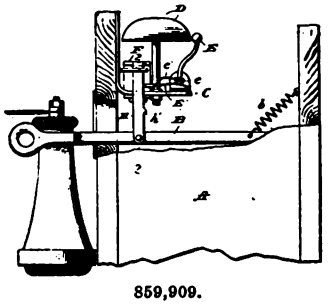
Among the manufacturers who were present at the convention, were the following: American Electric Telephone Company, Chicago, P. C. Burns; Chicago Telephone Supply Company, Elkhart, Ind., G. A. Briggs; Century Telephone Construction Company, Buffalo, N. Y., C. H. Macklin, W. H. Johnston, and G. F. C. Bauer; Canadian Independent Telephone Company, Toronto, Can., A. C. Wizner, F. D. Mackay and W. A. Taylor; Dominion Telephone Manufacturing Company, Toronto, Can., E. B. Overshiner, Stanley A. Duvall, A. Fox; W. H. Crumb & Co., Chicago, W. H. Crumb; Durant Electrical Supplies Company, Chicago; Frank W. Pardee, general sales agent, Chicago; Gould Storage Battery Company, New York, P. B. Yates, Toronto, Can.; Kellogg Switchboard and Supply Company, Chicago, J. C. Kelsey; H. J. Minhinnick, Chicago; North Electric Company, Cleveland, Ohio, R. Hendrickson; Rock Island Battery Company, Cincinnati, Ohio; Sterling Electric Company, Lafayette, Ind., W. E. Doolittle; Vote-Berger Company, Lacrosse, Wis., M. I. Berger.

Recent Telephone Patents

By David S. Hulfish

859,909. Attachment. Arne H. Berg, Clarkfield, Minn. Filed April, 1907. An alarm is sounded to identify the interrupting station when a receiver is lifted on a busy party line. (See cut.)

859,923. Condenser. Clarence Z. Davis, assignor to Cyphers Incubator Co., Buffalo, N. Y. Filed May, 1907. A rolled condenser, the two foil sheets projecting at the opposite ends of the roll for a connection.



859,909.

859,993. Pole. Samuel H. Summerscales, Winnipeg, Manitoba, Canada. Filed November, 1906. An iron pole, and means for attaching cross arms.

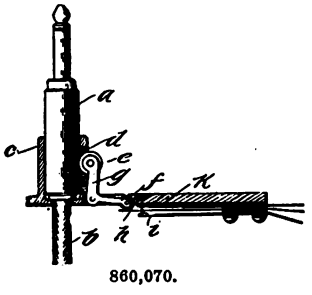
860,016. Protector. Frank B. Cook, Chicago, Ill. Filed May, 1906. Fuse, heat coil and arrester are compactly mounted, for substation use.

860,025. Attachment. Gerhardt E. Grimm, Philadelphia, Pa. Filed May, 1906. An antiseptic shield for mouthpieces.

860,044. Attachment. Edward S. Maddock, Chicago, Ill. Filed April, 1906. Slug magazine for coin-controlled devices.

860,070. Plug Switch. E. E. Yaxley, Chicago, Ill. Filed July, 1906. A roller engages the body of the plug when in its seat and moves a pivoted lever to operate a switch. (See cut.)

860,132. Drop. Henry J. Heeney, assignor to Holtzer-Cabot Electric Co., Boston, Mass. Filed September, 1906. A novel arrangement of target and retaining devices.



860,070.

860,175. Telephone System. David H. Wilson, assignor to George W. Kretzinger, Chicago, Ill. Filed October, 1904. A private line system, with selection between stations.

860,346. Coin Machine. Edward A. Beaumont, Jr., and George W. Garmon, Philadelphia, Pa. Filed June, 1905. A knife is arranged to cut a string if necessary to prevent fraud.

860,360. Switch. Earl C. Eldredge, Springfield, Mass. Filed July, 1906. A key of the plunger type.

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860,647. Coin Circuit. Claude D. Enochs, assignor to Western Electric Co. Filed September, 1905. A circuit for controlling coin distribution by polarity.

860,860. Party Line. Arthur J. Farmer, Detroit, Mich. Filed February, 1902. A trunk line has a step-by-step device for selecting the various parties of the line.

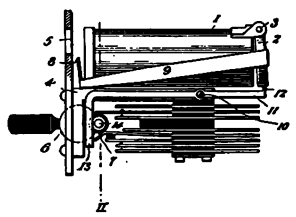
860,861. Terminal. Edward C. Flory, Santa Barbara, California. Filed August, 1906. Combined cable terminal and distributing box.

860,874. Key. Herbert L. Knight, assignor to Century Telephone Construction Co., Buffalo, N. Y. Filed January, 1906. An improved method of mounting the springs and lever in ringing and listening keys.

860,902. Switchboard System. E. E. Clement, Washington, D. C. Filed November, 1905. A two-wire common battery system with polarized line relay.

860,920. Lockout System. Daniel W. Kneisley, Dayton, Ohio. Filed July, 1906. A step-by-step lockout party-line system.

861,001. Signal and Key. Kelley M. Turner, assignor to General Acoustic Co., New York. Filed March, 1907. The



861,001

clearing signal is locked until unlocked by the listening key. (See cut.)

861,125. Composite. Isidor Kitsee, Philadelphia, Pa. Filed September, 1906. The telegraphic impulses are applied to the line through an induction coil. (See cut.)

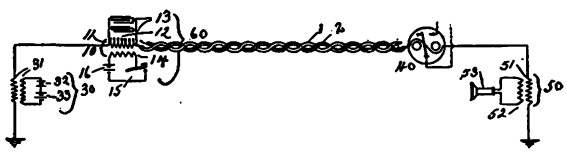
861,162. Bell. Charles C. Cadden, assignor to Century Telephone Construction Co., Buffalo, N. Y. Filed December, 1904. A telephone ringer of the vibrating electro-magnet type.

861,275. Insulator. Constantine Gallagher, Richmond, Va. Filed June, 1904. A slotted insulating block is held in a screw-threaded support.

861,315. Fuse. Ralph S. Peirce, assignor to Peirce Specialty Co., Chicago. Filed June, 1905. An enclosed fuse with soldered leading-in wires.

861,340. Trunk. C. S. Winston, assignor to Kellogg Switchboard & Supply Co. Filed January, 1905. A trunk circuit, shown in connection with Kellogg switchboard circuits.

861,357. Test Device. Gideon C. Buttler, Oklahoma City, Okla. Filed September, 1906. A specific arrangement of parts in a portable lineman's test set for locating faults on lines.



861,125.

861,459. Attachment. Henry Gross, New York, N. Y. Filed May, 1906. A sliding mouthpiece for cutting off sound from the microphone.

861,717. Splicing sleeve. Henry Frankel, New York, N. Y. Filed March, 1907. A screw-threaded joining device for wires.

861,728. Wire Coupling. Peter W. Hutchins, Modoc, Ind. Filed May, 1907. The wires to be joined are bent and passed through the device twice, in opposite directions.

861,808. Switchboard System. H. P. Clausen, assignor to American Electric Telephone Co., Chicago. Filed April, 1901. A magneto switchboard system.

861,809. Switchboard System. H. P. Clausen, assignor to American Electric Telephone Co., Chicago. Filed November, 1903. System for inaudible test on two-way common battery multiple switchboard.

861,887. Cable Hanger. Ralph S. Peirce, Chicago, Ill. Filed February, 1905. An endless marlin hanger with metal saddle for messenger.

862,072. Switchboard. Theodore A. Hammond and William P. Hammond, assignors to H. R. & K. Mfg. Co., Passaic, N. J. Filed November, 1903. A single-wire switchboard with means for making a bridging or looping connection at any jack.

862,084. Relay. George W. Lorimer, assignor to Lorimer Automatic Tel. Co., Augusta, Maine. Filed July, 1902. A specific arrangement of frame and armature; the relay acts as a sounder also.

862,211. Insulator Support. William Steiner, Muskegon, Mich. Filed March, 1906. A pole ring with insulators for distributing drop wires.

862,242. Attachment. Theodore Endean, Cleveland, Ohio. Filed April, 1906. A card index for desk stand.

862,334. Coin Collector. H. B. Holmes and E. B. Craft, assignors to Western Electric Co., Chicago. Filed February, 1906. A toll box for connecting or returning a deposited coin.

862,449. Hookswitch. E. B. Craft, assignor to Western Electric Co., Chicago, Ill. Filed April, 1906. The contact springs are set vertically against the side of the bell box.

862,497. Attachment. William J. Mogridge, Spokane, Wash. Filed November, 1906. A receiver holder for desk stands.

862,542-862,543. Cable Terminal. Frank B. Cook, Chicago, Ill. Filed January, 1906. A pole top can with distributing insulators, pothead terminal and protectors.

862,580. Relay. F. R. McBerty, assignor to Western Electric Co., Chicago. Filed July, 1906. The backstop screw has a pin through a hole in the armature to prevent unseating the armature.

862,616. Switchboard System. W. W. Dean, assignor to Kellogg Switchboard Supply Co., Chicago. Filed September, 1901. A two-wire common battery multiple system with differential supervisory relay.

862,713. Switchboard System. M. S. Connor, assignor to Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y. Filed May, 1904. A two-wire common battery multiple system.

862,909. Attachment. Ezra B. Helman, Indiana, Pa. Filed May, 1907. A receiver holder of wide adjustments.

863,230. Repeater Circuit. Herbert E. Shreeve, assignor to American Tel. & Tel. Co., Boston, Mass. Filed May, 1906. A repeater circuit with balancing means, to avoid "singing."

863,247. Transmitting Energy. Walter C. Yeatman, assignor to American Tel. & Tel. Co., Boston, Mass. Filed February, 1903. An iron-sheathed copper wire for "loading" effect on telephone transmission line.

863,253. Receiver. William R. Bankhead, Bremerton, Wash. Filed November, 1906. One pole of the permanent magnet is brought to the periphery of the diaphragm.

863,338. Trunk. C. S. Winston, assignor to Kellogg Switchboard & Supply Co., Chicago. Filed January, 1905. A trunk from a three-way cord-pair to a two-wire multiple switchboard.

Lower California Convention.

Southern California Telephone Exchange managers, numbering forty, from the various Southern towns, from San Diego to Santa Barbara, held their annual convention and banquet at Whittier, California, August 15th.

A visit to the State School and a drive among the orange groves were features of their afternoon's entertainment. After a visit at the local exchange office, Manager Wardman took his guests to Hotel Greenleaf, where a banquet followed a business meeting.

Wireless Telephones on the Battleships.

Wireless telephones have been installed successfully on the battleships Louisiana and Virginia. With their aid, conversation can be carried on at a distance of five miles. All battleships are to be equipped with them, which may account for the apparent indifference of the Navy Department concerning a new signal code.

The report has gone out from Youngstown, Ohio, that the telephone operators are answering subscribers' calls with their feet. This must be the newest "Ohio idea."

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Current Convention Papers*

PAST AND PRESENT CONDITION OF THE TELEPHONE BUSINESS.

DURING the past year telephony as a business has made good progress. The number of telephones in use has largely increased. Rates have been maintained and in some cases advanced. Competition between the Bell companies and the home companies has been carried on in a more business-like way than formerly. The old vindictive spirit has given way, in a measure, to more modern methods of business warfare. Seemingly the managers of the Bell companies have been brought to a realizing sense of their mistakes in thinking that the telephone business was their own exclusive property; that all Independent companies were trespassers and rebels against the God-given rights of the Bell Telephone Company.

The managers of the Independent companies have also learned from experience that business and not sentiment governs in telephony.

The inception of the Independent telephone movement was largely emotional or sentimental. The Bell Company failed to give what the people wanted and what the business of the country demanded, so the people proceeded to build local lines. Very few, none perhaps, knew what was before them. No wonder a few failed. The only wonder is that so many succeeded and are doing well today. There never was a business where there have been so few failures as in the telephone business. Individuals built short lines, companies were formed to build and operate larger plants, with little conception of the magnitude of their undertakings, but notwithstanding this lack of knowledge the service was generally of a satisfactory character, so much better than the people had been used to that the home companies were hailed as harbingers of better things in telephony and the Bell was relegated to the scrap pile in the minds of the people. The old octopus was not dead, however. It was not even asleep. It was all the time getting its second breath for the fray which was to come. Its managers were a little slow to realize that it had no exclusive rights which the people were bound to respect, and they finally awoke to the realization of the fact that to do business with the people, the people must be treated with some consideration. They eventually learned that the telephone business was like other kinds of business and must be carried on in a business-like manner and *not* as a monopoly. While they have not come to the "live and let live" policy of the merchant and manufacturer, they have gradually and slowly learned that they have no exclusive rights which they can flaunt in the faces of the people and at the same time be on reciprocal, friendly relations with them.

Heretofore the shibboleth of the Independent companies has been the faults and shotcomings of the Bell Company. The great success of the Independent companies has been built on the foundation of opposition to the old company, by reason of its arbitrary and unbusiness-like way of doing business. The time has come, or is fast approaching, when merit alone is to be the governing factor. Everything else being equal, that company giving the most satisfactory service is the one which is going to meet with the largest measure of success. The faults of the old company will be forgotten. People live in the present and plan for the future. Animosities and prejudices against the Bell Company can not longer be relied upon to build up and maintain Independent telephone companies. True it is that the home companies will always have some advantages over the companies controlled by people living at a distance, but this is getting to be of less importance every day. The telephone user is going to patronize the company giving the best service. This being the case, it behooves the Independent companies to give the best possible service and not depend upon sentiment longer to materially assist in building up or even maintaining the supremacy they so largely enjoy at the present time in this state.

You who have done so much have much more to do. Telephony, while far from being in its infancy, has not reached its limit by any means. Many of the companies represented here are unable to supply the demands for telephones. Nearly every farmer wants a telephone, and the farther away he lives the more use he has for a telephone. There is no rule to follow; there is no advice which can be given how best to meet the demand. Every company must decide these things for itself, but there is one thing that you must do and that is to give good service. It is better to have a hundred waiting to be connected up than to lose ten for causes which could have been avoided by a proper application of business principles to the details of management.

In addition to the qualifications necessary to success in ordinary business affairs one more must be added to warrant success in the telephone business, and that is politeness.

Politeness all the way up and down the line from manager to trouble-shooter. I verily believe that the failure to give satisfaction by the old Bell Company can be attributed more to the way patrons were treated by its employes than to any other one thing, and perhaps all others combined. Competition has forced a change in this respect. Even where there is no competition, service has been greatly improved, but it has not yet reached perfection.—*Paper read by Col. J. H. Hackett before the Illinois Independent Telephone Convention.*

DRY BATTERIES.

IT is not my intention to take up the construction of the dry cell at this time, but I will simply give you our experiences on the Chicago, Milwaukee & St. Paul Railway in using that class of battery in connection with our block wire service, together with a comparison of its cost with the gravity cell in such service. In 1905 we placed sixteen dry cells on the block wire at both Brookfield and Waukesha, Wis. On account of earth currents at Waukesha we used one of our other telegraph wires for a return, arranging the keys at both stations with front and back contacts, removing the circuit closers, and adjusting the circuit to close on the back stop without the battery and on the front with the battery, in a manner well known to you all. This circuit, including two 50-ohm sounders, measured 271 ohms. Each cell when placed in service measured 1.5 volts, and .125 ohms internal resistance.

At Brookfield we placed the battery on a shelf which had been used for gravity battery, and left in a somewhat unclean condition. At the expiration of twenty-three months each cell measured 1.31 volts, and 2 ohms internal resistance. At Waukesha we placed the battery far back on a new and clean shelf in the telegraph table, with a closed door. After twenty-three months each of these cells measured 1.38 volts, and .68 ohms internal resistance.

We are inclined to attribute the difference in condition of these cells to the condition of the shelves on which they were placed, because the service performed by each has been about the same. We estimate each system of cells has been used approximately one hundred and twenty times per day, 3,600 times per month, and which, if continued, would amount to 43,200 times per year. We also estimate that the keys were closed 3,360 times per day making dots and dashes necessary to form letters and figures, which, for one month, would amount to 100,800 times, 1,209,600 times per year, or 2,419,200 times in two years. From the way this circuit works now we know it will continue to work two years, and, perhaps longer.

Taking these two systems together, we had, to begin with, thirty-two cells and forty-eight volts. At the end of twenty-three months we had 20.96 and 22.08 volts, respectively, or 43.04 volts, a loss of approximately five volts. These thirty-two cells cost $5.12. To secure the same voltage it would have required forty-eight cells gravity battery, at an initial cost of forty-two cents per cell, or $20.16, to which we add the expense for maintenance of one dollar per cell per year, making a total of $68.16 for one year, and $116.16 for two years. For each additional two years the expense for maintenance would be $5.12 and $96, respectively, for dry and gravity cells.

At present about two gravity cells per mile are used on block wires on many of the western, and some of the eastern roads. Many of the block stations are closed during the night, and the arrangement of the dry cells to compensate for the extended sections at night will, we assume, take double the number of dry cells, or four per mile, to accomplish the same results.

Assuming the life of the dry cells, when properly installed and maintained, to be two years, we will estimate the maintenance only on a one hundred mile block wire circuit for a period of ten years, as follows: One hundred miles, at two cells per mile gravity would require two hundred cells. To secure the same voltage we would need one hundred and thirty-three dry cells, but on account of the longer sections at night, two hundred and sixty-six dry cells would be necessary. For a term of ten years each gravity cell would cost $10, while that of the dry cell would be only eighty cents, or comparatively: gravity $2,000; dry $212.80.

I would not recommend cutting down the number of dry cells to the same voltage, but would counsel using double the number of dry cells you use of gravity and thus secure fifty per cent more current to start with, and sufficient to hold up

*Secretaries of the various State associations are invited to send all papers bearing on the Independent telephone situation, no matter what the subject may be, direct to the publisher of this magazine. Co-operation of this kind will have a lasting benefit to the industry we are conscientiously endeavoring to serve.

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the service near the end of each two years. I estimate the expense as follows: 200 gravity cells, ten years, $2,000; 2,000 dry cells, ten years, $320, the latter showing a saving of $1,680. This would make a saving of $168 per year, which, reduced to a mileage basis, would be $1.68 per mile per annum.

In addition to this we do not need battery cupboard space in our stations, and are free from the accumulation of dirt, etc., accompanying gravity battery, at the same time saving the services of the lineman at each battery station four times per year, now entailing an expense of about $10 per battery station per year.

We are about to equip two block wire circuits, one two hundred and eighty-five miles and the other one hundred and twenty-five miles in length, with the dry battery system. A special key and a two-lever three point switch have been designed to take the place of the old standard telegraph key and one lever two point switch, for the purpose of preserving in the block wire all the good points with the single additional feature which eliminates practically all objections to the present arrangement, in that the operator at one station is unable to extend the circuit between the stations on each side without cutting his entire set out. This will prevent the signals passing any office, and overcome the danger of operators making mistakes which are liable now when the circuit is cut through as referred to.

In addition to using dry battery for our block wire system, I shall submit a proposition to the telegraph company before long for the use of dry cells on our short branch lines, where there are not to exceed, say, two or three offices, and where but a small amount of business is transacted. We are also using the dry cell exclusively in connection with our private line telephone systems, and use it in connection with our synchronizing self-winding clocks, and in our office bell and buzzer service; in fact, we use the dry cell wherever it is possible to do so to the exclusion of all others.—*Paper read by U. S. Fry, Milwaukee, before the convention of Railway Telegraph Superintendents at Atlantic City.*

THE VALUE OF GOOD ENGLISH TO THE ENGINEER.

TECHNICAL men are peculiarly prone to offend in the use of their mother tongue, because they have not, as a rule, read deeply in classical literature or been instructed thoroughly in the construction of the language. Their higher education is generally almost entirely technical. Yet the character of the technical man's language is important in his social and business intercourse; in his business and professional correspondence; in the promulgation of orders, rules and regulations for the guidance of those under his direction; in the preparation of specifications, contracts and reports; in writing and delivering addresses and technical papers, and in writing technical books for the advancement of his profession. A technical man is, presumably, an educated man, and if he does not speak and write like one, suspicion is cast upon the entire range of his learning. When a man cannot spell correctly, or use ordinarily good grammar, it is difficult to convince others that he is professionally able. There are many vocations in which it is not essential that a man be cultured and intelligent; but the technical professions are not among them. Nothing so surely makes a man's secret habits of thought, his real character, as the little tricks of speech which are exhibited when his mind is on the matter, rather than the manner of his speech.

In business correspondence the value of good usage is still more manifest than in conversation, since the written word is permanent, and correspondence greatly extends the field of one's intercourse. A letter often passes through many hands and multiplies the good or bad impressions it produces. If its import is not clear, it may cause disagreement or involve serious financial disadvantage. Even bad punctuation will often seriously alter the entire meaning of a sentence, and bad grammar in particular at once stamps a writer as being something of an ignoramus. The art of letter writing, like a knowledge of grammar, is commonly considered to be within the range of everyone; but anyone who has had large experience in business correspondence knows that few men write good letters. It is so rare to find a matter which is composed of more than one or two items, clearly, concisely and thoroughly discussed in a letter that favorable attention is immediately attracted to its writer. Not a few men owe the opportunity for advancement to their ability to write a good letter.

The detrimental results of bad English in conversation or in correspondence are by no means as great as in formal technical articles. Every normal, healthy-minded technical man desires to leave a permanent record of the results of his best thought and work to aid his co-workers and those that come after him. An ably written description of work performed, discoveries made or methods developed accomplishes more for the advancement of science than many well designed and well executed works. In the preparation of articles for the technical press and papers for the learned societies, there is time to study form and style and to eliminate errors due to haste; hence, when such matters are ill written, it is not unfairly argued that the writer is ignorant of the correct use of the language. Such an opinion is exceedingly detrimental to the writer. It weakens his arguments, causes him to be misunderstood, or so detracts from the interest of his readers that the matter is not read. The idea that a technical paper is dry at best, and that the English employed in it is of small consequence has long been proved incorrect. Certain of the better magazines print only carefully selected matter and reject everything but scholarly, well written articles. Their influence upon the language is quite as good as that of the better books of the day; but the well written article costs more money than the "pot-boiler," hence the magazine is more expensive, its circulation is limited, and it influences a smaller number of readers than its cheap and less worthy competitor. Yet there is so much nowadays that is well written that no busy professional man is willing to spare the extra time and effort necessary to read and digest an ill written paper.

The style should be crisp and clear. An elegant, showy style is often a sign of lack of breeding. Short words of English origin are invariably stronger and more rugged than their longer and more elegant synonyms which are derived from the Latin or Greek; hence their use is nearly always to be preferred. Simplicity and force demand simple, direct language. The style should be so smooth and so unostentatious that the hearer's attention is not drawn to the language, but is left entirely free to follow the course of the thought.—*Abstract of an address by John Lyle Harrington before the Technological Society of Kansas City.*

Use of Telephones on Cars.

There are three methods followed in the application of the telephone to electric railway dispatching: (1) Fixed telephone sub-stations in booths placed at suitable points along the line; (2) jack boxes at poles to which portable telephones carried in the cars may be hung and connected for temporary use; (3) portable telephone sets hung upon the front of the car, the vestibule platform of which serves as a booth, and attachment made by flexible wires to jacks at numerous poles along the line.

On some railway lines the method of connecting a telephone on the car with the line is not by means of a jack at the side of one of the poles, but by a long, slender rod carrying the wires, which may be hooked upon the main lines at any place.

The telephones used on electric railroad systems must give transmission which is clear and loud, and must be of types not liable to be placed out of service by the jar of continuous transportation on a car.

Application of the telephone to train dispatching on electric railways has resulted in a marked economy of both plant and operation, in that the ability of the superintendent to be informed as to the position of the various cars and to communicate with their operators gives a greater service efficiency to the road.

The telephone is of great service in severe snowstorms by reason of the facility which it affords for information to be given the train dispatcher as to the condition of the road. In cases of mishap the telephone affords means for the quick clearance of the track by the facilities of obtaining wreck cars or repair hands. In cases of accident not only can medical help be summoned for the injured, but means can be taken to procure information relative to details of the occurrence which may be of great importance in ascertaining the liability of the company.

Cheerfulness is like God's great ocean. Bathe in it continually and all the surliness, cares and rust of life will disappear, a new vigor will quicken your pulse and your eyes be clear to view your fellowmen in their right perspective.

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An Inexpensive Test Set

By Frank M. Slough

NOT unfrequently the small telephone companies feel they cannot afford the expensive test sets ordinarily used to measure cable trouble, and as a result are put to considerable expense and trouble to locate faults, besides inconveniencing their subscribers for days at a time, which would be entirely unnecessary if a reliable test set could be procured. Realizing the above conditions, a test set with which cable troubles may be located with precision, and requiring only an elementary knowledge of mathematics, is described herein.

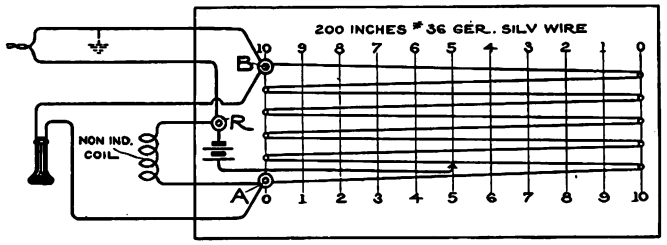

Figure 1

The test set, usually known as a "slide wire bridge," is shown in Figure 1, and is constructed as follows:

Upon one end of a pine board ¾ in. thick, 12 in. wide and 24 in. in length are fastened two binding posts, five inches apart, and called *A* and *B*, between which are driven four small tacks, equidistant from one another and from the binding posts. Twenty inches from this line of tacks are driven five more tacks an inch apart and parallel to the first. There is now stretched 200 inches of No. 36 German silver wire from posts *A* to *B*, taking the path around the tacks as shown in the illustration. In this way a long length of resistance wire is stretched on a board small enough to be portable. This wire is now divided into one hundred parts, ruled lines being drawn parallel to the line of tacks to mark off each length of wire into ten parts. Another post, hereafter called *R*, is now placed on the board near *A*, and a coil of German silver wire, non-inductively wound, is connected to these two posts. This coil should have an equivalent resistance to 1,000 feet of wire of a similar gauge to that under test. If 22-gauge is used the resistance of the coil should be 11.84 ohms.

To locate a ground in a cable wire, it is necessary to find a good wire which can be looped at the far end of the cable with the grounded wire and make a return circuit to the office over the same.

These two wires, the good wire and the grounded one, should be connected to the posts *R* and *B* respectively. With a telephone receiver across the posts *A* and *B* and a battery of dry cells connected to post *R* at one pole and on the other a cord terminating in a stylus, the instrument is ready to measure the total resistance of the two wires or the resistance of the "loop."

The stylus is brought into contact with the bridge wire at different points until no click is heard in the receiver. This point being noted, the number of divisions from it to the posts *A* and *B* should be counted and called *a* and *b*, respectively.

$$\text{Then length of loop in feet} = \frac{1{,}000b}{a}$$

For instance, if the point of balance is found fifteen divisions from *A* and eighty-five divisions from *B*, the length of the loop would be $\frac{1{,}000 \times 85}{15} = 5{,}666$ feet.

The next step is to take the battery wire from post *R* and ground it—the good wire also being removed from the post *R* and connected to post *A*.

A second point of balance is then found and will give the distance to the trouble in feet. Using the loop distance as found in the manner described previously, the distance is readily found.

$$\text{Distance to trouble in feet} = \frac{\text{length of loop} \times b}{100}$$

For instance, using the loop distance obtained in the previous example, and assuming the second point of balance to be located twenty divisions from post *B*, the distance to the trouble would be $\frac{5{,}666 \times 20}{100} = 1{,}133\frac{1}{3}$ feet.

The construction of the stylus used in making this test is very simple. Use a small flat stick of wood with two German silver springs fastened to it, one on either side; the lower one to be twisted near the end into the shape shown in the illustration and the upper one adjusted so a contact is made with the lower when the latter is depressed on the slide wire. A wire is then soldered to the upper spring and fastened to the wood handle so as not to break off easily.

It can be readily seen that at no time will a spark be caused at the point of contact on the slide wire, and consequently the wire will not be damaged thereby.

With an outfit substantially as described, one is enabled to locate grounds in cables with nearly as good results as were possible to obtain with the higher priced instruments.

With a few modifications, the distance in feet to the point where a wire becomes broken or burned in two can be found in much the same manner with this outfit.

The battery is replaced by a tone which can be produced in several ways, one of the simplest being caused by a few cells of dry battery operating an ordinary low-wound buzzer in series with the primary of a

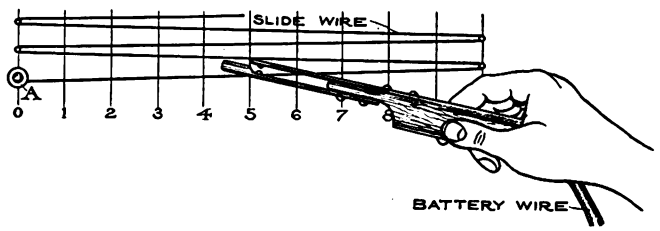

Figure 2

telephone local battery induction coil, the secondary wire of the coil being used in connection with the bridge in place of the batteries previously used. The "open" wire is connected to the *B* post of the bridge, the good wire of the pair is connected to the *A* post, to which posts the receiver also is connected as in the previous tests of resistance. The one secondary wire of the coil is then connected to the ground and the other to the stylus, which if constructed as described should be reversed when using. That is, it should be turned over and the spring to which the wire is attached should be moved over the slide wire until the point is found where no tone is heard.

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In making the capacity test for "opens" it is not necessary or even desirable to loop the "good" and "bad" wires at the distant end of the cable. When the quiet point is found the divisions are counted, as before, to posts *A* and *B*, and the results called *a* and *b*, respectively. The distance to the fault is then found, it being assumed that the length of the cable is known in feet, and this can be ascertained by measuring any pair of wires therein and taking one-half the value of the loop distance found, as in the previous example.

$$\text{Then, distance to fault} = \frac{a \times \text{length of cable in feet}}{b}$$

It is sometimes difficult to find a point on the slide wire which gives absolutely no tone in the receiver, but in such case the point where the minimum amount of tone is heard is used instead. The amount of tone heard in the receiver can be controlled to a considerable extent by varying the number of dry cells used.

A pair in the cable which is short-circuited can be tested in the same manner as a ground, it being only necessary to ground one side of the pair and then conduct the measurements on its mate in exactly the same manner as in locating a ground. The same plan is also available to locate crosses between wires of different pairs.

The Situation in Roanoke.

The secretary of the Virginia Independent Telephone Association points out that the Virginia & Tennessee Telephone Company at Roanoke, while purporting to be an Independent operating concern, is far from it. The newspapers made the announcements for this company, which claimed to have purchased the Bell system, but it is generally known that the majority of the V. & T. T. Company stock is at present owned by the Bell. Competition in Roanoke virtually ceased from the date of the transaction and it would require no better evidence to fix the question of ownership than to study the surface indications as they now exist. The Virginia & Tennessee Telephone Company is operating under a franchise granted to it as an Independent concern, but it is rebuilding and installing Bell apparatus and is making long distance Bell connections. The methods of the company smack of Bell domination. Throughout the city of Roanoke, both in business and resident sections, there is considerable complaint expressed against the contracts under which patrons and prospective patrons of the Virginia & Tennessee Telephone Company is signing up for the party telephones provided for by the company's franchise.

The following extracts are given, one from the franchise, and one from the contract—both dealing with the party line. It will be readily seen just where the cause of the trouble lies. The contract embodies conditions and stipulations not provided by the franchise and it is against this assumption on the part of the telephone company that is causing the trouble. The following extracts from the franchise define the party line and the conditions under which a party line may be secured and used. The extract from the contract gives certain conditions under which the company says these party telephones shall be installed and used.

(No. 3) Party Line, Standard Equipment, Unlimited Service. This consists, in part, of a pair of wires running from the exchange to the subscriber's station, to which pair of wires four subscribers, and no more, are connected. Any one of the four subscribers can be called without ringing the others.

Sec. 11. Any subscriber shall be entitled to, and shall be furnished either class or kind of service above designated, as he may desire; and when either the Duplex Line (No. 2) or the Party Line (No. 3) is desired by such a subscriber, he shall be furnished the same at the price designated for such service, regardless of whether or not other subscribers are obtained for such Duplex Line or Party Line, as the case may be.

The following four paragraphs are a portion of the contract itself:

The company reserves the right to cancel any party line contract, upon sixty days' notice, whenever:

1st. The number of stations, by reason of the withdrawal of one or more subscribers, falls below the number upon which the contract is based.

2d. Whenever in its judgment the use of the subscriber holding such contract is such, from large use or other causes, as to interfere with the reasonable use of others connected with the same circuit.

This request becomes a binding contract when accepted by the company's manager, by his signature thereto, or by establishing the said station. The conditions on the back hereof are made a part of this contract, and its terms cannot be varied nor waived by any representations or promises of any canvasser or other person, unless the same be in writing and signed by said manager.

Those who have familiarized themselves with the terms of the franchise regarding party lines, are not, in some cases, signing for those lines under the company's contract. Some have signed, not knowing there is this marked difference between the terms of the franchise and the contract; others will not consider the instllation of such lines; while still others are investigating the conditions under which the company can so digress from the specific expressions of the franchise under which the company is supposed to be doing business in Roanoke.

By way of explanation, some have expressed the idea that these party lines are not as remunerative to the company as individual or duplex lines, and that by the insertion of these conditions into their contracts, they can discourage the installation of the party lines.

The Retail Merchants' Association has addressed the following letter to the members of the association:

Your attention is called to the contracts which are being presented by the telephone company of this city for signature where the party lines provided for under sections 3 and 11 of its franchise are installed.

By comparing the two you will readily observe that the company is taking advantage of the subscriber contrary to the contract made with the city when the franchise was granted.

Our attorney advises that our members do not sign the contract, as it reads in violation of the franchise, but demand a contract that shall conform to the said franchise in sections 3 and 11.

Should the company decline to install the 'phone in accordance with their franchise, you are advised to communicate with our attorney, who will bring the matter to the city attorney's and grand jury's attention, and which will result in compelling a compliance with the franchise or revoking of same.

The Franklin County Telephone Company at Rocky Mount made a traffic arrangement with the V. & T. T. Company when it was an open ally of the Bell, but owing to the turn of affairs does not longer desire to be associated in this manner. Mr. B. L. Fisher of the Franklin County Telephone Company is also secretary of the Virginia Independent Telephone Association and being a loyal Independent, he would have conditions properly understood.

Think of it! The National Telephone Company, Ltd., London, instead of printing its telephone directory once a year, is going to print two editions, one in January and one in July. The company believes "that the increased expense entailed by issuing two complete directories annually instead of one will be justified by the convenience to the public of having the names and numbers of new telephone subscribers available more promptly." Wouldn't that jar you!

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Epitome of the Month

PERSONAL.

O. A. Nelson has been elected manager of the Home Mutual Telephone Company, Kidder, Mo., A. J. Spangler having resigned.

H. C. Slemin, of the Stromberg-Carlson Telephone Manufacturing Company, Rochester, found time to visit us briefly while in Chicago in September.

T. Kerr has been elected general manager of the Kankakee Independent Telephone Company to succeed A. J. Vernier, who is now manager of the Pontiac Company.

Orrin F. French has been appointed to the position of superintendent of construction for the Manitoba provincial government telephone system, succeeding Francis Dagger.

Philip H. Cole, formerly with the National Telephone Company, London, visiting in Chicago while en route to China, where he will take charge of the Shanghai Mutual Telephone Company and its affairs.

J. C. Murphy, former manager of the North Dakota Independent Telephone Company's plant at Bismarck, has become manager of the company's office at Fargo, N. D., to succeed Hugh L. Peoples, resigned.

Gustav F. C. Bauer, sales engineer of the Century Telephone Construction Company, Buffalo, was in Chicago the latter part of August on the sad mission of attending the funeral of a sister who was stricken very suddenly.

Edward C. Stoeffhaas, superintendent of the factory of the Premier Electric Company, has had eight years of valuable experience in all departments of telephone manufacturing and as installer. The past five years' work has especially qualified him for his present position.

Frank L. Middleton, representing the Automatic Electric Company in Oklahoma and Indian Territory, was recently a pleasant visitor at SOUND WAVES office. Mr. Middleton left Chicago in July and makes his home at Tulsa, where he will install a new system to compete with the Pioneer T. & T. Company.

G. W. Buzzell, widely known among Independent telephone operators for his aggressiveness, was killed by an electric current in his home town of St. Johnsbury, Vermont, August 12. It seems that Mr. Buzzell was warned to be careful in an attempt to remedy a cross of the electric light and telephone wires, but it was not heeded.

David E. Evans, former president of the Maryland Telephone Company, died recently at Baltimore. He was born in Wales, fifty-seven years ago. Mr. Evans was prominent as a consulting electrical engineer and as a builder of railways. While a young man in Wales he won the praise of Queen Victoria for his heroic rescue of a party of miners cut off below ground by a rush of water.

S. D. Levings has joined the firm of McMeen & Miller, engineers and contractors. Mr. Levings is a raw recruit from the Bell camp, but he will devote his time in future to the building of Independent systems. Of large experience in the work he will feel perfectly at home in his present environment. He is now on the ground at Houston, where he will have active supervision for his new employer.

M. B. Overly, at present general manager of the Central Home Telephone Company, the Independent Long Distance Telephone and Telegraph Company, and the Long Distance Telephone and Telegraph Company has resigned to take effect October 1st to engage in other business in Cleveland, Ohio. L. G. Parker, at present auditor of the Central Home Telephone Company, has been appointed general manager to fill the vacancy, when it occurs.

O. A. Cole has been elected assistant general manager of the Bureau County Telephone Company at Princeton, Ill. Mr. Cole commenced at the bottom of the ladder when he entered the telephone field and he has advanced step by step until he is now actively in charge of one of the most prosperous Independent lines in the state. His plans since assuming his new duties embrace a number of minor changes in the present system, but none of them are of a radical nature and will not interfere with the operation of the lines as they are now.

NEW COMPANIES.

LOOKEBA, Okla.—The Farmers Central Rural Telephone Company has been incorporated.

HALLOCK, Minn.—The Kittson Telephone Company will build several new farmer telephone lines.

COLUMBUS, Miss.—An effort is being made to organize an Independent telephone system here by W. D. Smith.

THOMPSON, Iowa.—The King Mutual Telephone Company has been incorporated with a capital stock of $2,520.

BEL AIR, Md.—The Susquehanna Pole Line Telephone Company has been incorporated with a capital stock of $50,000.

CHILLIWACK, B. C.—Mr. J. W. Sutherland and others are forming a company to install an Independent telephone system.

MAX, N. D.—The Max Telephone Company has been incorporated with a capital stock of $10,000 by D. J. Grant and others.

TORONTO, Can.—The Harrietsville Telephone Association of Harrietsville, has been incorporated with a capital stock of $25,000.

LEXINGTON, Neb.—An Independent Telephone Company has been incorporated with a capital stock of $12,500. C. F. Wiggins is interested.

PINGREE, N. D.—The Pingree-Foothill Telephone Company has been incorporated with a capital stock of $30,000 by Thomas Price and others.

CARSON CITY, Neb.—An Independent telephone company has been organized here with a capital stock of $250,000 by J. F. Adams and J. G. Sweeney.

EDMUND, Okla.—The Edmund Southwestern Telephone Company has been incorporated with a capital stock of $1,800 by W. R. Corbett and others.

ARNETT, Okla.—The Armett Telephone Company has been incorporated with a capital stock of $10,000 by C. O. Shaffer, J. O. Balston and J. J. Henry.

SWEA CITY, Iowa.—The Farmers Central Telephone Company has been incorporated with a capital stock of $420 by C. H. Giles, John Nelson, Gust Thorson.

QUAKER CITY, Ohio.—W. W. James, Isaac Cline, George Lyman and others have organized the Farmers Telephone Company with a capital stock of $3,000.

DEMOCRAT, N. C.—The North Buncumbe Telephone Company has been organized with a capital stock of $5,000. James N. Morgan and others stockholders.

NEW ROCKFORD, N. D.—The Air Line Telephone Company has been incorporated by A. J. Ritcher, J. P. Knoack and J. A. Paulson, all of New Rockford, N. D.

MONTELLO, Wis.—The Marquette Telephone Company has been incorporated with a capital stock of $5,000. Incorporators: M. H. Prafte, J. Wood and Dr. F. C. Wood.

SWANTON, Ohio.—The Swanton Home Telephone Company has been incorporated with a capital stock of $20,000 by Mathias Lochbihler, M. J. Linehan and L. M. Lathrop.

AMBOY, Wash.—The Amboy Telephone Company of Clarke county has been incorporated with a capital stock of $2,000 by Johnson Hooper, Wm. Healy and Ira Siesecker.

PARDEEVILLE, Wis.—The Pardeeville Telephone Company has been incorporated with a capital stock of $4,000. Incorporators: Frank H. Smith, Lyell V. Smith and Miss Smith.

ST. CROIX, Wis.—At a recent meeting of the St. Croix Mutual Telephone Company W. E. Flemming, president, resigned and O. M. Thatcher was elected in his place.

WATSEKA, Ill.—The Watseka Telephone Company has been incorporated with a capital stock of $35,000 Incorporators: P. N. H. Munson, H. P. Turner, and S. A. Walsh.

CLARION, Pa.—Application will be made for a charter for a new company to be known as the Montery Telephone Company, to operate in Clarion and Armstrong counties.

DURAND, Wis.—The Intercounty Telephone Company has been incorporated with a capital stock of $8,000. Incorporators are: W. H. Gifford, Ward E. Loodell and N. P. Fox.

MEKINOCK, N. D.—The Turtle River Co-operative Telephone Company has been organized with a capital stock of $50,000. The company will build rural telephone lines.

ONTARIO, Wis.—The Brush Creek Farmers Telephone Company has been incorporated with a capital stock of $3,000. Incorporators: I. O. Hoff, P. A. Penderson and L. Olson.

BRANCHVILLE, Va.—The Union Telephone Company has been incorporated with a capital stock of $2,500 by W. R. Sykes, W. W. White, C. N. Vick and J. V. Rogers, J. G. Stancill.

CURTISS, Wis.—The Curtiss & Withee Telephone Company has been incorporated with a capital stock of $900. Incorporators: Theo. Thompson, Wm. Peterson, and J. S. Jacobson.

LOWELLSVILLE Ohio.—The Ohio Telephone Seal and Lock Company has been incorporated with a capital stock of $5,000 by C. E. Robinson, John Freck, W. W. Cubbison and others.

RALEIGH, N. C.—The Midway Telephone Company is chartered to operate a line from Midway, Davidson county, to Winston-Salem. E. C. Snider is the principal incorporator.

CHESAW, Wash.—An Independent telephone company is being organized here for the purpose of constructing lines to Myncaster. K. F. Briggs is at the head of the movement.

JONESBORO, Tenn.—The Locust Mount Telephone Company has been incorporated with a capital stock of $5,000 by Messrs. S. T. Martin, R. A. Walker, Jesse Hunt, C. Horn and others.

GOODRICH, Wis.—The Goodrich Telephone Company, Taylor county, has been incorporated with a capital stock of $3,000. Incorporators: John Kraemer, E. M. White and F. M. Perkins.

SLATER, Ky.—The Slater Telephone Company of Slater county has been incorporated with a capital stock of $600. The incorporators are: C. E. Batts, T. J. Davis, and F. M. Ashby.

RICEVILLE, Pa.—The People's Mutual Telephone Company has been incorporated with a capital stock of $10,000. Incorporators: Jesse Martin, T. L. Dobbins, A. Burrows and others.

OXFORD, N. Y.—The Preston & Norwich Telephone Company has been incorporated with a capital stock of $200.00. Directors: L. S. Law, C. W. Powers, B. E. Slater, Preston, N. Y.

LOGAN, Okla.—The Logan Telephone Company, Beaver county, has been incorporated with a capital stock of $5,000. The directors are: Frank Wentworth, J. Thompson and Sam Smith.

VAN ETTEN, N. Y.—The Van Etten Telephone Company has been incorporated with a capital stock of $5,000. Incorporators: Dr. J. W. Gee, George Banfield, B. U. Osburn and others.

MOTT, N. D.—The Cannon Ball Telephone Company has been incorporated with a capital stock of $5,000. The incorporators are: George H. Stone, Ray W. Conklin and F. I. Bonesho.

RICE LAKE, Wis.—The Rice Lake & Northwestern Telephone Company has been incorporated with a capital stock of $10,000. Incorporators: W. H. Bundy, L. S. Everts and J. E. Horsman.

SUPERIOR, Wis.—The Superior Rural Telephone Company, Douglas county, has been incorporated with a capital stock of $2,500. Incorporators: George M. Seldone, R. S. Hartley and Henry Ward.

CALEDONIA, Wis.—The Caledonia Farmers Telephone Company, Waupaca county, has been incorporated with a capital stock of $1,500 by Fred Fergot, Fred Krueger, Wm. Morien and Theo. Seefield.

DAYTON, Ohio.—The Dayton Telephone Lockout Manufacturing Company has been incorporated with a capital stock of $100,000 by Dan W. Kneisly, Charles S. Billman, William H. Schank and others.

COLUMBUS, Ind.—There is a movement on foot at Hope to organize a stock company to take control of the property of the Hope Independent Telephone Company's plant, which is valued at about $20,000.

HERBSTER, Wis.—A Farmers' telephone company is being organized here by George A. Howard of Port Wing. Lines will be erected at this city and connections eventually effected with Gornucopia.

GRACEMONT, Okla.—The Spring Creek & Anadarko Telephone Company has been incorporated with a capital stock of $1,080. The incorporators are A. M. Pickett, C. A. Robinson and H. H. Timkin.

BENTON, Ark.—The Benton Telephone Company of Saline County has been incorporated with a capital stock of $3,000. The incorporators are: J. M. Caldwell, president; W. L. Caldwell and J. F. Lee.

NORWOOD, Ohio.—The Southern Ohio & Tri-State Telephone Company, recently incorporated with a capital of $50,000, presented a request for a franchise to the Norwood council. The system is automatic.

WALLIS, Texas.—The Wallis Telephone Company has been organized here with a capital stock of $2,500 and with the following officers: E. F. Louwien, manager; W. L. Guyler, secretary and treasurer.

CINCINNATI, Ohio.—The Fitzsimmons Telephone Company is incorporated with a capital stock of $5,000. The company has franchises in Oakley and Silverton. Harry Burckhardt is head of the company.

DOUBLE SPRINGS, Ala.—The Winston County Telephone Company has been formed with a capital stock of $5,000. Dr. C. A. Olivett, Addison, president, and Z. McVey, Double Springs, vice-president.

STELLA, Okla.—The Farmers Independent Telephone Company of Cleveland County has been incorporated with a capital stock of $500. The incorporators are: R. S. Wheeler, James Church, C. W. Wilson and others.

KNOX, N. D.—The Knox Telephone Company has been incorporated with a capital stock of $6,500; incorporators, C. J. Markstad and Martin Steen, both of Knox, and James Kane, Lisbon Amory Association, Lisbon.

LOUIS, Okla.—The Louis Farmers Co-Operative Telephone Company has been incorporated with a capital stock of $2,000. The incorporators are C. J. Johnson, J. D. Sanders, B. F. Waller and J. L. Sanders of St Louis

FAYETTSVILLE, W. Va.—The Lansing Telephone Company has been incorporated with a capital stock of $5,000 to build and operate a telephone system. The incorporators are: J. H. Nickel, W. R. Dickerson, N. Crawford.

LEXINGTON, Tenn.—The Broadway Home Telephone Company has been organized with a capital stock of $5,000. The officers of the company are: J. Hawthorne, president; P. H. Evans, secretary; A. H. Insco, treasurer.

PRINCETON, Ont.—A rural telephone system has been installed in Princeton. The line will connect Princeton, Drumbo, Eastwood, Gobles, and will eventually be extended to Paris. Mr. F. J. Daniel ot Princeton is president.

NEOLA, Iowa.—An Independent telephone company is being organized, consisting of the citizens of Neola, with a capital stock of $25,000. Among those interested are Dr. J. H. Lowrey, Frank B. Downs, T. J. Ensign and R. Clark.

LESLIE, Ark.—The Leslie Telephone Company has been incorporated with a capital stock of $5,000, of which $3,000 has been subscribed. The incorporators are R. W. Foley, president; H. F. Wilson, vice-president; John R. Clay, secretary.

TUNKHANNOCK, Pa.—The Merchants Telephone & Telegraph Company of Tunkhannock has been organized. The company will construct a line between this city and Chinchilla. Additional lines will be built to a number of other towns.

STANLEY, Wis.—The West Worden Mutual Telephone Company has been organized with Dave Neinholtz, president; Ole Samuelson, secretary, and Ole Krogen, treasurer. Five miles of new line will be constructed with central connections here.

CHALLIS, Idaho.—The Central Idaho Telephone Company has been incorporated with a capital stock of $15,000. The new company will build a line from Challis to Bayhorse, Clayton, Robinson, Stanley, Bonanza, Custer, Sunbeam and Loon Creek.

NORWICH, N. D.—A co-operative telephone company has been organized here and will build to Velva. Nearly all the farmers along the lines of the proposed system have taken stock in the company and the work of building will soon be commenced.

SUPERIOR, Wis.—The Douglas County Co-operative Telephone Company has filed articles of incorporation and elected the following officers: Henry Ward, president; H. D. Coyne, secretary; George H. Seldne, vice-president; and E. Erickson, treasurer.

MACON, Mo.—The Theodore Gary Investment Company announces the opening of its office in the Telephone building, Macon, Mo. This company is incorporated for $200,000, and is organized to deal generally in securities of first class telephone companies.

WESTBY, Wis.—Articles of incorporation have been filed by the Dell Co-operative Telephone Company, of Dell, Vernon county (P. O. address Westby). It has a capital stock of $2,500 and the incorporators are Edward Clark, Henry Markee and W. D. Miller.

LORD'S VALLEY, Pa.—The Lord's Valley Telephone Company, Pike county, has been incorporated with a capital stock of $5,000. Incorporators: Q. Lord, Geo. P. Pierson, J. Schmacizle, Lord's Valley; D. G. Hatton, Notch; Fred K. Westbrook, Blooming Grove.

MONTPELIER, Vt.—The Southern Vermont Telephone Company has filed articles of incorporation authorizing a capital stock of $5,000. Those interested are: H. P. Clark, Woodstock; W. A. Perkins, Bethel; F. A. Richmond, Woodstock, and L. G. Lyman of Hartford.

DEWITT, Va.—The Dinwiddie County Telephone Company has been organized with a capital stock of $15,000. The following officers have been elected: W. M. Sterns, president; Dr. B. C. Jones, vice-president; A. J. Sutherland, secretary, and J. E. Young, treasurer.

CINCINNATI. Ohio.—The Southern Ohio Tri-State Independent Telephone Company has been incorporated with a capital stock of $50,000 by D. G. Collins, George H. Kolker, A. J. Koch and others. The company will operate in Clermont, Warren and Butler counties.

ALTON BAY, N. H.—A stock company is being formed here to construct a trunk line from this place through Farmington,

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Rochester, Somersworth, Dover, Newmarket and Rockingham to Exeter, where a connection will be made with an Independent system now in operation.

Rayville, La.—An Independent telephone company is being organized here by Brown M. Dorrity. The new company will build lines from this city, Mangham and the Gold Mine Plantation and thence to Winnsboro and further south. Application has been made for a franchise.

Portland, Maine.—The Corporation Trust Company has been organized for the purpose of operating roads, railroads, telegraph and telephone lines, and holding bonds and stock. The capital stock is $3,500,000. The officers are: M. W. Baldwin, president; Charles D. Fullerton, treasurer.

Bethel, Ont.—The Peoples Mutual Telephone Company, Ltd., has filed articles of incorporation with a capital stock of $21,000. The following directors have been named: T. A. Crawford, W. H. Sine, Arthur F. Rightmeyer, W. H. Allison, A. S. Brown, all of the township of Sophiasburg.

Pilot Grove, Mo.—The Lazy Bend Telephone Company has been incorporated with a capital stock of $4,000 and the name changed to the Pilot Grove Independent Telephone Company and the following officers elected: J. V. Merceroe, president; Isaac Smith, secretary; Henry Brownfield, treasurer.

Willow Springs, Mo.—The Willow Springs Local and Long Distance Telephone Company has been incorporated with a capital stock of $50,000. The following officers have been elected: H. J. Howe, president; T. F. Muir, vice-president; George H. McClain, secretary and treasurer; W. N. Wicks, manager.

Carlos, Minn.—The Central Telephone Company has been incorporated with a capital stock of $25,000. The company will construct, maintain, operate and own telephone lines, systems and exchanges in the county of Douglas. The incorporators are Emil Erickson, Eagle Bend, Minn.; J. J. Bengson, Parkers Prairie, Minn.; Nels Nelson, Carlos, Minn., and others.

Murdockville, Pa.—The Murdocksville Telephone Company has been organized and will soon file articles of incorporation. Among those interested in the new enterprise are: J. C. Campbell, W. W. Inglefield, D. M. Scott and others. The company will build lines from Finley township, Allegheny county to Murdocksville, Five Points, Burgettstown and other places.

Norwood, Ohio.—The Norwood Telephone Company (Station H, Cincinnati) has been incorporated with a capital stock of $15,000. The company will operate a telephone and telegraph system in Hamilton, Clermont, Warren, Butler, and Montgomery counties. The incorporators are: Philip White, Pleasant Ridge; Ashley Lowry, Peter Brooks, Harry N. Koverman and G. Tilden Devis of Norwood.

Napoleon, Ind.—The Napoleon Telephone Company has filed articles of incorporation with the Secretary of State. The capital stock is $15,000. The company proposes to construct, equip and operate a telephone exchange in Napoleon, and telephone lines through Ripley, Decatur, Franklin, Dearborn, Ohio, Switzerland, Jefferson and Jennings counties. The following directors have been elected: Jacob A. Meyer, Frank G. Grow, G. W. Foreman.

ELECTION OF OFFICERS.

Roswell, N. M.—The Roosevelt County Telephone Company has elected the following officers at its annual meeting: C. E. Lukens, president; C. E. Harris, general manager; S. L. Ogle, vice-president.

Venus, Texas.—The Venus Telephone Company, recently organized, has elected the following officers: A. D. Frost, president; A. J. Florey, vice-president; John W. Bassett, secretary; C. L. Baker, treasurer.

Butte, Mont.—The Montana Independent Telephone Company has elected the following officers: H. A. Gallwey, president; P. B. Moss, vice-president; Charles J. Kelly, secretary and treasurer; T. S. Lane, managing director.

Fredericksburg, Va.—The following officers were elected at the annual meeting of the stockholders of the Toluca & Fredericksburg Telepnone Company: Hugh Adie, president; C. A. Bryan, secretary; E. S. Moore, manager.

Hillsdale, Mich.—At the annual meeting of the Hillsdale County Telephone Company the following directors were elected: W. W. Hannibal, M. Kelley, George Cooper, J. C. Gear, A. J. McCutchen, Charles Moore and others.

Princeton, Ill.—The Bureau County Independent Telephone Company has reorganized and elected the following new officers: Aaron Dunbar, president and general manager; Elmer Sapp, vice-president; O. A. Cole, assistant manager.

Victoria, B. C.—At the annual election of the Fort Seneca Mutual Telephone Company the following officers were elected: L. C. Umsted, president; W. C. Rosenberger, vice-president; I. S. Edwards, secretary· Frank Edwards, treasurer.

Henderson, Minn.—At the annual meeting of the Henderson Telephone Company the following officers were elected: Hans Enes, president; August Ney, vice-president; A. C. Blasing, secretary; L. A. Guilbert, treasurer. The company is contemplating some extensive improvements.

Hilo, Hawaii.—The Hawaii Telephone & Telegraph Company has elected the following officers for the ensuing year: John A. Scott, president; E. E. Richards, treasurer; H. Vicars, secretary. The company will improve its city service and its lines to Ookala.

Salt Lake City, Utah.—The Utah Independent Telephone Company has elected Herber M. Wells as president and M. H. Walker as vice-president. The capital stock has been increased from $1,000,000 to $1,300,000. The company is reorganizing with H. J. Grant in charge.

Avon, Ill.—At the annual meeting of the Avon Mutual Telephone Company the following officers and directors were elected: Dr. S. S. Clayberg, president; Oliver Crissey, vice-president; Lester Ross, secretary; A. Sundberg, treasurer. Directors: George W. Shinkel, L. R. Lockwood, Lester Ross.

Eureka Mills, Va.—At the annual meeting of the Central Telephone Company the following officers were elected: A. J. Terry, president; W. G. Williams, secretary-treasurer; W. G. Williams, general manager. The company is in a prosperous condition and has declared a 6 per cent divident. (P. O. Keysville, Va.)

Medford, Ore.—The Medford-Blue Ledge Telephone & Telegraph Company has been organized and the following officers elected: F. C. Page, president; Charles Strange, vice-president; W. I. Vawter, treasurer; Holbrook Withington, secretary; Walter H. Parsons, general manager. Lines are to be erected from Medford to the Blue Ledge with a branch at the Sterling mine.

FRANCHISES AND TRANSFERS.

Maroa, Ill.—The council here has granted a franchise to D. S. Anderson for a new telephone line.

Rock Hill, S. C.—The Rock Hill Telephone Company has been granted a twenty-five year franchise.

Ottawa, Ill.—The Ottawa Home Telephone Company is seeking a franchise to locate in Marseilles.

Appleton, Wis.—The Wolf River Telephone Company has been sold to the Fox River Valley Telephone Company.

Luray, Va.—The town council of Luray has sold a telephone franchise to the Page Valley Telephone Company.

Butler, Ohio.—A franchise has been granted to the Union Telephone Company to operate an exchange at this place.

Berthold, M. D.—A franchise has been granted to Messrs. Russel and Gray to install a telephone exchange in this city.

Rantoul, Ill.—Coon Brothers are seeking a franchise from the city council for a franchise to install a telephone system.

Doerun, Ga.—The Doerun Telephone Company has recently secured a franchise from the city and will put in an exchange.

Waterloo, Ind.—The Home Telephone Company of Ft. Wayne has been granted a franchise for a telephone exchange at this place.

Waxahachie, Texas.—The city council has granted a franchise to the Texas Telephone Company to construct telephone lines through the town.

Pierre, S. D.—The Great Western Telephone Company has made application for a franchise in the city. It proposes to install a local exchange.

Rochester, Minn.—The Tri-State Telephone & Telegraph Company of Minneapolis, has made application for permission to operate a system of this city.

Schenevus, N. Y.—A franchise has been granted to the Schenevus-Worchester Home Telephone Company to install a telephone system in Milford, N. Y.

Jeffersonville, Ky.—The Jeffersonville Telephone Company has asked the Board of Public Works for a franchise. Jacob Eberts is president of the company.

Columbus, Ind.—The Grammer telephone system in the Burnsville neighborhood has been sold to the Citizens Telephone Company. The price paid was $5,000.

Niles, Mich.—The Cass County Home Telephone Company has purchased the Cassopolis telephone property with the exchanges and will merge the two lines.

Elyria, Ohio.—The Columbia telephone exchange has been sold to a mutual company of patrons for $5,000. The new company consists of A. Harold, R. Squire and J. E. Rundel.

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ONEONTA, Ala.—The Oneonta Telephone Company has sold its line from Oneonta to Hunt, via Rosa, Cleveland and Blountsville to the Blount County Consolidated Telephone Company.

CENTRALIA, Wash.—The Northwestern Long Distance Telephone Company has been granted a franchise to install a local exchange in this city. A central energy plant will be installed.

DURAND, Wis.—The Inter County Telephone Company has purchased the county lines south and east of this place. The company will make some important improvements and expects to greatly improve the service in its territory.

APPLETON, Wis.—The Fox River Valley Telephone Company has purchased the exchanges at New London and Weyauwega from the Inter Urban Telephone Company. The company will build Neenah, Menasha and Maukauna next year.

BERLIN, N. H.—A franchise has been granted to the Essex & Coos Telephone Company to establish a telephone system in this city. It was granted upon the recommendation of the Vermont & New Hampshire Independent Telephone Association.

SHERMAN, Texas.—The North Texas Telephone Company has been granted a franchise to put in a local exchange at Pilot Point. The officers of the company are: S. W. Porter, president; D. S. Donaho, vice-president; C. A. Shock, secretary-treasurer and general manager.

HIGHLAND, Ill.—James S. Cummings of St. Louis, proprietor of the Highland Farmers & Merchants Telephone Company has sold out to local parties. The officers of the new company are Henry Buchheim, president; A. P. Mosimann, vice-president; C. T. Pabst, secretary and treasurer.

JEFFERSONVILLE, Ind.—The Home Telephone Company, J. W. Fortune, secretary, filed with the Board of Public Works a request for a telephone franchise. If granted, the home company agrees to have a plant in operation within two years and will have connection with the home in Louisville and New Albany.

FINANCIAL.

CHICAGO, Ill.—Pierce Specialty Company has increased its capital stock from $50,000 to $100,000.

DENISON, Iowa.—The Crawford County Telephone Company has increased its capital stock to $120,000.

CAMBRIDGE CITY, Ind.—The Citizens Telephone Company has increased its rates from $1.00 to $1.25.

WORTH, Mo.—The Worth Mutual Telephone Company has increased its capital stock from $10,000 to $15,000.

LINCOLNVILLE, Me.—The Lincolnville Telephone Company has increased its capital stock from $5,000 to $10,000.

DAHLGREN, Ill.—The Dahlgren Peoples Telephone Company has increased its capital stock from $10,000 to $12,500.

SUNBURY, Ohio.—The Delaware County Telephone Company has declared its regular semi-annual dividend of 6 per cent.

GRAND RAPIDS, Mich.—The Citizens Telephone Company has paid the fortieth quarterly dividend, amounting to $54,619.

KEYSVILLE, Va.—At the annual meeting of the Central Telephone Company of Eureka Mills, a 6 per cent dividend was declared.

MINNEAPOLIS, Minn.—The Tri-State Telephone Company has declared the seventeenth quarterly dividend at the rate of 6 per cent per annum.

DANA, Ill.—The Central Illinois Independent Telephone Company has increased its capital stock from $30,000 to $75,000. C. G. Sauer, of Dana, is president.

GLENWOOD, ..is.—The West Wisconsin Telephone Company has increased its capital stock from $7,000 to $12,000. W. H. Park, president; C. S. Fallensbee, secretary.

PENN YAN, N. Y.—The Penn Yan Telephone Company has raised its rates in residences from $12 a year to $15 a year, and in business houses from $20 to $24.

BEATRICE, Neb.—The Home Telephone Company of this city has filed its annual report with the state railway commission, showing that it has $187,500 of capital stock subscribed. The officers of the company are: J. F. Hemenway, president; R. V. Montague, vice-president; W. H. Caman, secretary and treasurer.

ROCHESTER, N. Y.—The United States Telephone Company's gross earnings for the first six months of this year amounted to $234,038, while its expenses involved $98,754, leaving net earnings of $135,284. Charges, taxes and dividend disbursements on the company's preferred stock amounted to $82,048, leaving a surplus for the first half of this year amounting to $53,236 or $3,017 more than that for the first six months of last year.

NEW CONSTRUCTION AND EXTENSION.

HUMBOLDT, Iowa.—The Rural Union Telephone Company will improve its exchange.

WHEELER, Wis.—The Knapp Telephone Company will install a local system at this place.

CLEAR LAKE, S. D.—The Clear Lake Telephone Company will build two rural extensions.

NEWTON, Iowa.—The Jasper County Telephone Company will greatly improve its system.

GRANVILLE, N. D.—The Union Telephone & Light Company will erect a new building at Granville.

ST. THOMAS, N. D.—The Home Improvement Company is putting in a local exchange at Hensel.

PELHAM, Ga.—The Drake Telephone Company will extend its lines to Moultrie, Albany, and Cairo.

GARFIELD, Ohio.—The Garfield Telephone Company will extend its lines from Panguitch to Ranch.

BATEVILLE, Ark.—The Sharp County Telephone Company will install a new switchboard at Hardy.

CRETE, N. D.—The Hample-Crete Telephone Company will build an extension from Crete to Stirum.

GRIDLEY, Ill.—The Consolidated Telephone Company is planning to rebuild its system at this place.

CARYVILLE, Wis.—The Caryville Telephone Company will build seven additional miles of rural lines.

LAMB, Ind.—The Farmers' Telephone Company will extend its lines to include this place, in its system.

UNIVERSITY PLACE, Neb.—The University Place Telephone Company will construct a new $25,000 plant.

ARCADIA, Iowa.—The West Side Telephone Company will improve and extend its system at this place.

MADISON, Ind.—The Madison Telephone Company will erect a new building and install a new system.

GRAND FORKS, N. D.—The Heyton Telephone Company will construct a line 10 miles north from Arville.

TACOMA, Wash.—The Home Telephone Company will extend its lines to Vashon and Maury Islands.

GRANT, Iowa.—The Grant and Elliott Telephone Company has bought the Vetter line and will rebuild it.

PAXTON, Ill.—The Paxton Telephone Company will place new cables underground in the alleys and streets.

DE FUNIAK SPRINGS, Fla.—The De Funiak Springs Telephone Company will establish a system at Milligan.

BELVIDERE, Ill.—The Boone County Rural Telephone Company will extend its lines from Herbert to Kingston.

KEARNEY, Neb.—The Kearney Telephone Company will install a new switchboard and make other improvements.

ANACORTES, Wash.—The Farmers' Mutual Telephone Company will construct a new telephone exchange building here.

AUDUBON, Minn.—The Audubon Telephone Company is contemplating many improvements and extensions on its system.

TEXICO, N. M.—The Roosevelt County Telephone Company will construct an exchange and rural system at Blacktower.

GREAT FALLS, Mont.—The Lewistown Telephone Company will extend its lines to Armington, Stanford and Lewistown.

BELLEFOUNTAINE, Ohio.—The Farmers' Telephone Company plan the extension of lines to reach West Liberty and De Graff.

SAN MARCIAL, N. M.—The Commercial Club of this place, will undertake the construction of a telephone line to Rosedale.

SAN JOSE, Ill.—The Forest City Telephone Company will overhaul its entire system and will install a new switchboard.

CRYSTAL CITY, Man.—The Louise Telephone Company will install a new switchboard and make many other improvements.

KANSAS CITY, Mo.—The Kansas City Home Telephone Company plans to construct a new telephone exchange building.

GOSHEN, Ind.—The Home Telephone Company will make improvements amounting to about $25,000 in its telephone system.

CAIRO, Ill.—The Home Telephone Company will expend about $50,000 this fall in the rebuilding of its exchange and lines.

BERKLEY, Cal.—The Home Telephone Company has purchased the site for a permanent exchange of its system at this place.

OSCEOLA, Ill.—The Empire Telephone Company has decided to commence stringing new wire to Bradford and several other points.

DECATUR, Ill.—The Home Telephone Company has bought ground on North Main street for $12,000 and will erect a new building.

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HAWARDEN, Iowa.—The New State Telephone Company will build a toll line from here to Oreton, Orange City and Granville.

BETHPAGE, Tenn.—The Sumner County Home Telephone Company has established an exchange and will soon install a switchboard.

VENUS, Texas.—T. A. Atkinson and J. A. Russell are arranging for a new telephone exchange to be built by the citizens of this place.

TULARE, Cal.—The Home Telephone Company of this city is making plans to extend its lines over a considerable portion of the county.

CRETE, Neb.—The Crete Telephone Company has broken ground for a new brick building, to be occupied by it for a permanent home.

WINNIPEG, Man.—The Government Telephone and Railway Department will erect a building for its local telephone system, to cost $100,000.

ARGYLE, Iowa.—The Big Four Telephone Company has purchased two lots on Main street and will erect a modern exchange building.

NELIGH, Neb.—A new telephone line constructed by controllers of the Northern Antelope County system, is to be built 18 miles northeast.

PASADENA, Cal.—The Home Telephone Company will make extensive improvements shortly, and has increased its capital stock to $1,000,000.

AUBURN, Ind.—D. W. Strauss, manager of the Home Telephone Company, announces that his company will build an exchange at Waterloo.

KENDRICK, Idaho.—The Interstate Telephone Company will install a telephone system at this place. M. E. Crandell is in charge of the work.

CLIO, N. C.—The Clio Telephone Company will purchase, improve and extend the Clio telephone system. The authorized capital stock is $7,000.

LANSING, Mich.—The Citizens' Telephone Company will construct a modern, fireproof building for its central office and exchange at this place.

KENNEBEC, S. D.—Jene Brown and Byron Reid are arranging to install a local telephone exchange here, and are receiving substantial encouragement.

CANDO, N. D.—The Farmers' Telephone Company will erect a line from Cando to Engeland, thence to Rock Lake, Ellisberry, Armourdale and Hansboro.

LADYSMITH, Wis.—The Chippewa Valley Telephone Company will make some important changes in the present system by a metallic circuit system.

CARDENAS, N. C.—E. H. Ballentine, business manager of the Cardenas Telephone Company, says his concern will build 20 miles of additional toll line.

WILLARD, N. M.—The New Mexico Telephone Company will install a new telephone plant at this place. H. A. Hart of Sante Fe is in charge of the work.

HOMESDALE, Idaho—Among the improvements planned by the Independent Telephone Company is the construction of a line from Caldwell to Homesdale.

KILBOURNE, Ill.—The Citizens Telephone Exchange has been completely destroyed by fire with a loss of $2,000. The exchange will be rebuilt as soon as possible.

WOODLAND, Cal.—Seven Independent farmers' lines in Yolo county, have agreed to install an exchange at this place. Miss Julia Bray will be the local manager.

BRACKETTSVILLE, Texas.—A new telephone line will be erected from Uvalde and Eagle Pass to Brackettsville by J. H. Wiggins and L. Rust of Del Rio, Texas.

NEW ULM, Minn.—The Mankato Citizens' Telephone Company will erect a line from Mankato to Judson and will also build an exchange at Madison Lake.

PEORIA, Ill.—The Interstate Telephone Company of this city will construct new lines to Canton and Pekin. Manager W. G. Olwin has charge of the work.

GAIL, Texas.—The Staked Plains Telephone Company with headquarters at Lubbock, will install a local exchange in this town, and will build a line to Post City.

BEMIDJI, Minn.—The Northwestern Telephone Exchange Company will make considerable improvements, installing additional cables on the poles about the city.

ARKADELPHIA, Ark.—The Arkadelphia Telephone Company will rebuild its entire system. New poles will be erected and the old wires will be discarded for cables.

WELLINGTON, Ohio.—The Wellington Telephone Company will purchase a new switchboard, with an ultimate capacity of 1,000 lines and otherwise improve its system.

MOLINE, Ill.—The Union Electric Telephone & Telegraph Company will extend its lines into East Moline and Silvis and will improve the service in each of the cities.

SILVER CITY, N. M.—A new long distance telephone line will be built from here to Deming by the newly organized Silver City, El Paso & Southwest Telephone Company.

BEATRICE, Neb.—At a special meeting of the Nebraska Independent Telephone Association it was decided to build toll lines to Marysville, Kas., Pawnee and Falls City.

ALBERT LEA, Minn.—The Hartland Telephone Company is making arrangements for the extension of its telephone lines from its recent terminus at Freeborn into Matawan.

NORFOLK, Neb.—W. J. Stadelman of the Norfolk Long Distance Telephone Company announces that the new exchange building will be equipped with automatic instruments.

HAMILTON, N. D.—Permission has been granted by the village council of Hamilton to the Citizens' Telephone Company of Fargo, to construct and maintain a telephone system at this place.

GEORGETOWN, Texas.—The M. N. Halley Telephone Company has been granted permission to erect a telephone line along the Georgetown and Round Rock road and the Mason and Tisdale road.

MASON CITY, Ill.—The Mason City Telephone & Telegraph Company will install a switchboard with a capacity of 200 lines. Twelve country lines with 250 telephones will be connected with the exchange.

OCONOMOWOC, Wis.—The Badger Telephone Company is preparing to extend its lines from Toland to Hartford and also from Toland to North Lake. A switchboard will be installed at Thompson.

CHARLESTON, Ill.—The Coles County Telephone Company will reconstruct its exchange property. The plans call for an all cable plant and a new central energy switchboard and central office equipment.

SILVER CITY, N. M.—The Grant County Telephone Company will construct a telephone line from Silver City to Mogollen. The line will be metallic circuit and will revert to government management after ten years.

PHOENIX, Ariz.—C. W. Hinchcliff of Tucson, general manager of the Consolidated Telephone, Telegraph & Electric Company, announces that the company will make numerous additions to the lines in Phoenix.

SALEM, Ore.—The Northwest Long Distance Telephone Company, which is affiliated with the Home Telephone Company, has been given permission to construct a long distance telephone line and do business here.

MISCELLANEOUS.

PETERSBURG, Ind.—The Cumberland Telephone & Telegraph Company is removing its exchange and system from this place.

KENDRICK, Idaho.—George Walker of the Interstate Telephone Company announces that the company will change its system to full metallic.

BETHEL, Maine.—At a recent meeting of the stockholders of the Bethel Local Telephone & Telegraph Company it was decided to merge with the Maine Telephone Company.

SYRACUSE, N. Y.—The annual convention of the New York Independent Telephone Association will be held here September 25th. The headquarters will be at the Yates Hotel. The officers are Alexander H. Cowie, president; H. M. Eaton, secretary; George R. Fuller, treasurer.

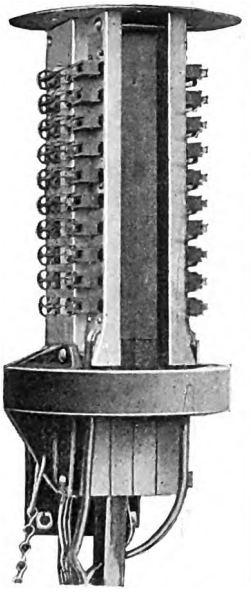
CLEVER, Mo.—The business of the Cash Electric & Telephone Company, hitherto conducted at Norwood, Mo., will be moved to Clever (Billings Post Office), and the name of the firm changed to Clever Telephone & Supply Company. An Independent exchange will be installed and operated.

OBERLIN, Ohio.—There is a movement on foot here to merge the various telephone companies in Lorain county. The merger includes five towns as well as the business of the Southern Telephone & Toll Company. The Oberlin Telephone Company will put in a new switchboard and new instruments will replace old apparatus.

ROCKWELL CITY, Iowa.—A meeting between the Central Mutual Telephone Company and the Cedar Mutual Telephone Company resulted in the signing of a contract whereby the Central Mutual agrees to give patrons of the Cedar Mutual free connection with any patron of the Central Mutual who may be reached directly through its Lohrville and Rockwell City

A WINNER

Type **F**



It Saves You

A great deal of time in connecting up.
The cost of a self-soldering nozzle.
The cost of a wiped joint.
Making an expensive pothead.

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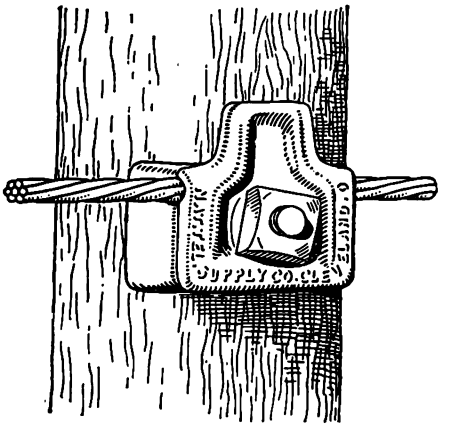
Non-Breakable Messengers

HANGERS



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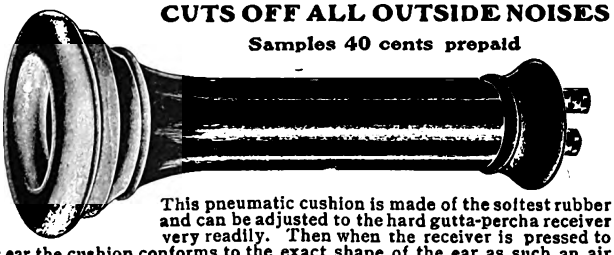
CUTS OFF ALL OUTSIDE NOISES

Samples 40 cents prepaid



This pneumatic cushion is made of the softest rubber and can be adjusted to the hard gutta-percha receiver very readily. Then when the receiver is pressed to the ear the cushion conforms to the exact shape of the ear as such an air pad alone could, absolutely cutting off outside noises and giving the ear a comfortable cushion instead of a rigid receiver. It also holds the ear-drum a little further away from the metallic receiver and by virtue of the air and flabby rubber cushion it neutralizes the harsh crashl crashl noises.

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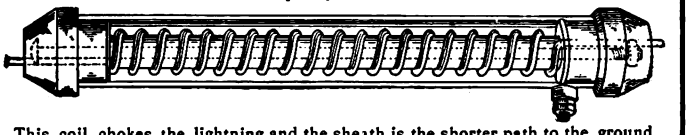

This coil chokes the lightning and the sheath is the shorter path to the ground and the one the lightning takes.

No Resistance coils.
No fuses to burn out.
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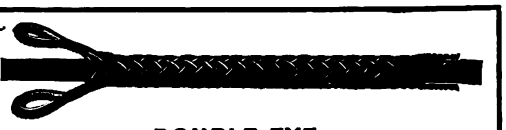

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No. 16. Operator's Set and Accessories
No. 17. Parts of Apparatus
No. 18. Magneto Telephones of all kinds
No. 19. Central Energy Switchboards
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No. 21. Protective Apparatus and Terminal Equipment
No. 22. Construction of Country Telephone Lines
No. 23. Eight-Party Selective Ringing Telephones
No. 25. Four-Party "Leich" selective Telephone System
No. 26. Telephone Power and Ringing Equipment

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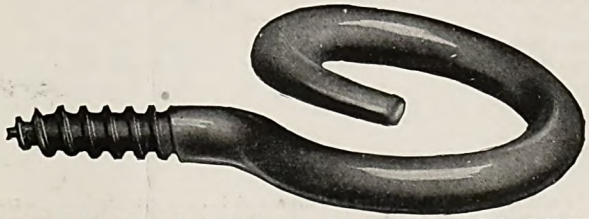

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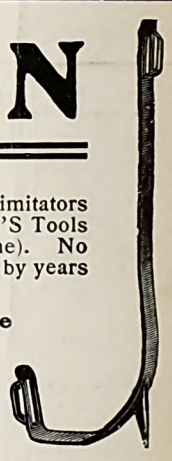

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SOUND WAVES

VOLUME XIV
No. 5

INTERNATIONAL TELEPHONE JOURNAL

OCTOBER 1907

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CHICAGO, OCTOBER, 1907

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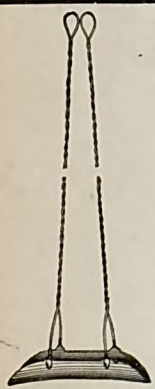

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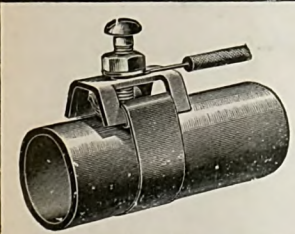

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5, 6 and 7 inch Styles Holds 12,500. 15,000 and 17,500 Lbs. Respectively.

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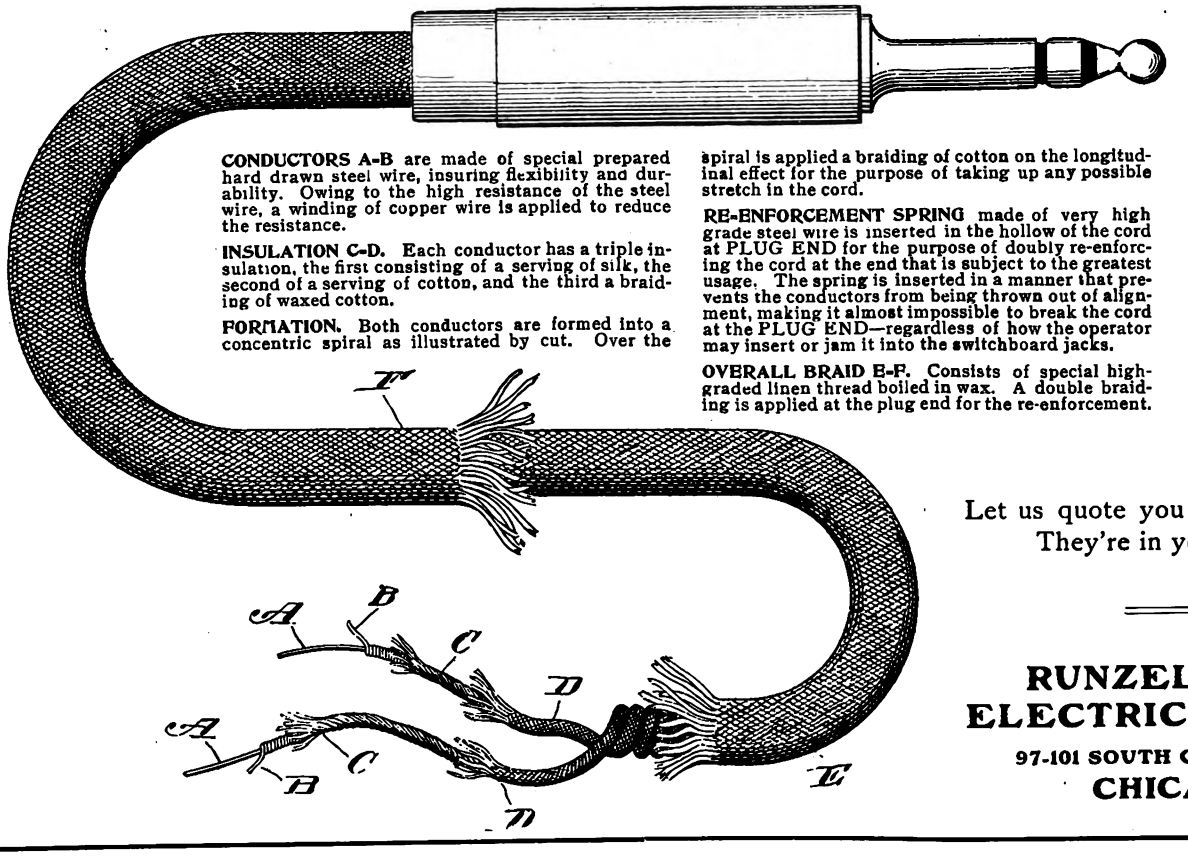
PREMIER BB STEEL CORD



CONDUCTORS A-B are made of special prepared hard drawn steel wire, insuring flexibility and durability. Owing to the high resistance of the steel wire, a winding of copper wire is applied to reduce the resistance.

INSULATION C-D. Each conductor has a triple insulation, the first consisting of a serving of silk, the second of a serving of cotton, and the third a braiding of waxed cotton.

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RE-ENFORCEMENT SPRING made of very high grade steel wire is inserted in the hollow of the cord at PLUG END for the purpose of doubly re-enforcing the cord at the end that is subject to the greatest usage. The spring is inserted in a manner that prevents the conductors from being thrown out of alignment, making it almost impossible to break the cord at the PLUG END—regardless of how the operator may insert or jam it into the switchboard jacks.

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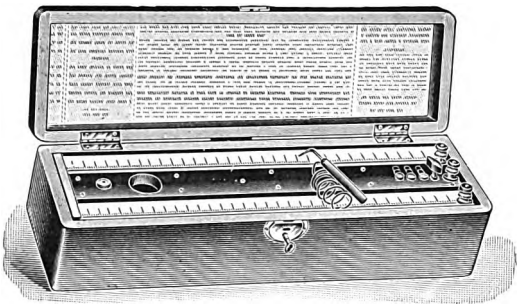

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An instrument which gives you your reading in resistance directly in ohms, eliminating the required expert knowledge to operate a bridge. For determining the resistance of coils, transmitters, receivers, drops, etc., and locating shorts and crosses on your lines, it is unequalled. We guarantee the accuracy of these instruments to one-tenth of an ohm. Will ship on 30 days' trial, returnable at our expense if unsatisfactory.

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SOUND WAVES

International Telephone Journal

VOL. XIV CHICAGO, OCTOBER, 1907 No. 5

ISSUED THE FIFTEENTH OF EACH MONTH BY THE

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Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisement can not be shown until the appearance of the edition containing it.

The publisher of SOUND WAVES *guarantees the advertiser a minimum circulation of 5,000 copies each month.*

CHICAGO, OCTOBER, 1907.

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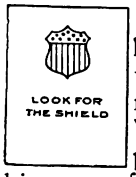
WIDE-OPEN COMPETITION.



THE announcement has just been made that henceforth the Western Electric Company will deal direct with the public. This statement is significant because it is official. The Western Electric Company is scattered pretty much all over the world and is the big manufacturing auxiliary of the American Telephone & Telegraph Company and its subsidiaries. For several years salesmen for this concern have been scouring the country in a vain effort to sell everything of its manufacture, except those sacred old relics the transmitter and receiver.

And now the ban has been lifted from these matchless, exclusive gems! Anybody can buy them—everybody can buy them. In single pairs, $3.14; in hundred pairs, $2.74; how many, please? A set in beautiful shadow frames would cost a mere trifle and for a den souvenir they should find ready sale. Employees will win lasting favor in the eyes of their managers to remember this suggestion about Christmas time. And then the spirit of your patronage will endear you to the Bell manufactory—the public can buy and you are included as part of the public, don't you know, besides you will be about all the patron that will rally to this final blandishment if you adopt this hint.

President Vail, of the Bell Company, must be a fine optimist. Who will want to buy his old transmitters and receivers, anyway? There hasn't been a change made in either for more than a decade and what is more there will be no change. The old white solid back was a good transmitter fourteen or fifteen years ago, but there are all kinds of better transmitters in competition with it now, and actual millions of consumers know the difference. The unsightly old Bell receiver with its exposed connecting posts will probably never be supplanted by an improved pattern. You can talk into the transmitter and hear through the receiver, under wholly favorable conditions, and that is quite enough consideration from the Bell.

Mr. Vail thoughtfully explains that there are at the present time many inefficient telephone instruments in use and he desires to see these replaced by standard apparatus. He must have been thinking of his old, superannuated pets, but his careful regard for the public is a mere hobgoblin. The Bell Company change its receivers and transmitters! Not yet, my Mary Ann. There are more than 3,000,000 sets doing "tolerably fair" and to make an alteration in a single instrument would precipitate more trouble than this old water-soaked octopus could stand, even after doubling its night rates.

But there is a "nigger in the woodpile" somewhere or this revolutionary order would not have gone forth.

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THE NIGGER IN THE WOODPILE.

It was less than two years ago when the American Telephone & Telegraph Company ceased to loan money to its sub-licensee companies. This action was followed by a wholesale discharging of employees in different parts of the country and there were other radical evidences of retrenchment. This was the first step in a long series of events that point clearly to the abandonment of the chain system of operating the big telephone trust. When the Bell Company needed funds it was obliged to come down to the level and show its real financial worth, just as any ordinary seeker for coin. When bankers discovered the chain system, they insisted upon a decent and legitimate procedure. The old saw that a chain is no stronger than its weakest link held true in this case as it does in every other instance. No institution can thrive by taking the profits of a healthy subdivision to reimburse the losses of a weaker concern under the same management. The Bell Company had its powerful, money-making subsidiaries and its tottering, money losing organizations. It used the Western Electric Company as an "equalizer."

Today we find that these several units of the former parent organization are being made to stand alone. In the east three subsidiary companies are being merged into one. The combination of the three presents a whole sufficiently important to float an additional $60,000,000 bond issue. It is part of the Bell plan of reorganization which is going on all over the country.

The Western Electric Company is now free to enter actively into competition with the Independent manufacturer. It is not laboring under a handicap of any kind. It is a formidable concern with years of experience in the manufacture of telephones and accessories and it stands out in the open with a cinch on all the patronage of the American Telephone & Telegraph Company and its forty-five or more sublicensees and what additional business it can get from the Independent operators.

Reform is always in order for the other fellow.

WILL INDEPENDENTS BUY?

Terrible thought! Will Independents buy of the Western Electric Company? To say the least, the Independents are confronted with a new problem. They will meet in convention, resolve to ignore the octopus when brought face to face with it, but they will buy some of the goods, nevertheless, just for the novelty of the thing—if not for the price! The operator knows all about Bell competition. He has been elbowing with it for many years. He knows all the tricks.

This same operator knows something about Independent competition. He can write a book about it, and he has, but no one heeded him. His troubles fell on deaf ears—he could settle it himself, and he has. His salvation was found in the telephone service he was able to give. The service meant greater care in choosing apparatus. He bought the kind that would stand the severest tests. He bought what he had proved to be equal to the best. He's buying it yet. He has every kind of instrument known to his trade—except the Bell—and now he can buy that. He has one of the rarest curio shops that was ever brought together and he may want to try out another instrument—just for idle curiosity. He is apt to buy Western Electric—a little of it— just to see how it "jibes" with the rest of his system. He can, you know, and he will have to be "shown."

A word to the wise is superfluous.

INTERNATIONAL CONVENTION DATE.

The wisdom of the Executive Committee of the International Independent Telephone Association is choosing January as the month for holding the regular annual convention is to be commended. The exact date has not been announced, but the convention will most probably be called for the week ending January 26, 1908. At any rate, the prime object of changing the date from summer to winter was to have the meeting during the period of Chicago's Electrical Show, now acknowledged to be one of the greatest electrical attractions of record. The tremendous strides marked by electrical progress require a great annual exposition and no other place in America is more convenient in which to make the display than its second city. The attraction has much of interest for telephone men who will be glad to attend the convention of their association and enjoy the electrical show at the same time.

Manufacturers of telephones and accessories are already planning exhibits for the big show which will be held as usual in the Coliseum. They will thus not be required to display their products within the narrow walls of hotel rooms. We are confident that the "merger" of these two great events will insure a great assembly of telephone operators. They will convene at a time most propitious to plan the campaign of another year and when the weather will inspire action rather than recreation and rest.

When bored, say the wrong thing to the right person at the wrong time, and things may liven up.

KEEP YOUR AX TO THE GRINDSTONE.

A boy was once turning the grindstone while his father sharpened the ax. The day was warm and the stone turned hard. Presently the boy burst forth:

"Say, pa!"

"What is it?"

"Isn't that ax sharp enough now?"

"No, my son," was the reply.

"I don't see why, said the boy, "It looks just as bright as it can be and I think we have been grinding long enough."

"All right, son," said the father, "Take the ax and cut into that piece of pine over there."

The boy complied and with a few vigorous strokes sent the chips flying.

"See, pa, how easy it cuts!" he exclaimed.

"Now try it on this piece of oak," declared the father.

The boy did, but with all his efforts he could make but little progress.

"I didn't think it would make so much difference," he said, as he again took hold of the crank. "What's the reason? Isn't it a good ax?"

"Yes, the steel in it is the best to be had. The only thing it lacks is sharpening. No matter how good steel it is, it will not be a good cutter till it has been

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thoroughly sharpened. And it won't do to stop grinding when the ax looks bright. The brightness will not cut anything, it is the edge that counts."

We were talking recently with a young man who had quit the high school. He had done so because of ill feeling toward one of the teachers. His plan was to give up all hope of further education and go at once into practical work. Now the injury which he felt he had received from that teacher may have been real or it may have been imaginary. In either case it is a small thing to stand in the way of a completed education, especially in these days when education is so much appreciated and fully prepared men are so much in demand. Because the crank turns a little hard he is willing to stop grinding his ax, content to be able to cut only the soft pine of common things, while others become able to cut their way through the solid oak of difficulties and make a place for themselves in the world. No matter how much native talent and ability a young man possesses, it takes study and training to fit him for the best that there is in life. The teachings of practical experience are most thorough and are highly valued by all thinking men. But the study and training of school give a person the advantage of the practical experience of generations.

Have you kept your ax to the stone?

For goodness sake, don't label laziness patience, and then call it a virtue.

HISTORY OF THE AUTOMATIC.

IN this issue we are beginning a series of articles treating the development of the automatic telephone. When we employed phony at Purdue University, to contribute regularly to this publication and to dispense his knowledge to our "troubled" correspondents, part of the preliminary skirmish in our getting together brought up the question of topics upon which he was to write. The subject of the automatic was proposed, for it has had very little airing. The principal reason for this seems to have been because of the hard labor it involved. Mr. Smith isn't afraid of work. He rather likes it and he has gone about this subject in a scientific, unemotional and business-like manner. During the summer vacation period, when most instructors were inclined to take advantage of a well-earned holiday, Mr. Smith visited Piqua, Ohio—the town which stands out on the map as the birth place of the Lorimer automatic system. From this point he next sought out the Lattig and Goodrum base of operations at Rochester, New York, and for several weeks he hobnobbed with the American system and its method of ousting the hello girls. The Strowger came in for its generous share of investigation, as well as the Globe and the Clark systems. Mr. Smith was busy. He has had the co-operation he had hoped for in his work and with the knowledge he had of automatics before this exhaustive, personal research, we feel that this series will be most important. There is a tense interest all over the country concerning the automatic method of exchange operation and we are confident that Mr. Smith's work will find an appreciative audience.

Cheerfulness is one thing that cannot be wasted. Give it away, throw it away, spread it broadcast; it is

NEW INTERNATIONAL HEADQUARTERS.

INTERNATIONAL headquarters, Chicago, after November 1st. This definite determination was concluded at a meeting of the Association's Executive Committee at a recent session, when other important measures were discussed looking to a more efficient organization, planned upon broad lines for the advancement of the Independent telephone interests. Chicago is the logical center of the Independent industry and the International headquarters should have been established here long ago. We are confident the change will speedily confirm this assertion.

Before adjourning as an executive body, the following resolution was introduced by Mr. J. B. Hoge, seconded by Mr. Geo. N. Bandy, and unanimously adopted:

WHEREAS, the city council of the city of Chicago is considering the advisability of compelling the Chicago Telephone Company to connect with the lines of the Independent telephone companies, and

WHEREAS, we believe it to be for the best interest of the citizens, mercantile and manufacturing interests of Chicago, that the city should have an up-to-date local and long distance Independent telephone company, therefore be it

Resolved that we, the Executive Committee of the International Independent Telephone Association are unalterably opposed to any Independent connection with the Bell Telephone Company in the city of Chicago or elsewhere, as well as being opposed to any terminal for the Independent telephone companies to be used in connection with the Bell system.

From which it may be deduced that the International Association is not in favor of Bell connections, now or ever. Chicago should have a city council smart enough to know that competition is desirable in the telephone business. It should have a council that would not attempt to destroy the prospect of another operating company which would give it connections with a telephone system outnumbering by many thousands of instruments the system of the Bell Company. Independent connections may be had with Chicago when Chicago has an Independent operating exchange. It cannot get these connections in any other way.

Be determined; the rest is easy.

TELEPHONE WIRE.

"GOOD telephone wire is like a good foundation—it lasts. Soft, single galvanized fence wire will answer, but it is like building a house on the sand. Fence wire is single galvanized with cheap zinc and cannot last long. It is drawn from Bessemer steel, high in resistance and is not uniform, tough and pliable like iron wire. It was never intended for telephone purposes.

"Telephone wire is double galvanized with pure zinc and will last indefinitely. It is made of iron which is low in resistance, tough and pliable and capable of standing a good elongation and torsion test. It is especially made for telephone use and will last several times as long as common wire."

Thus sensibly does the Indiana Steel & Wire Company address the telephone operator. It has the ring of genuine merit, but to emphasize this company's confidence in its own argument and product, it sends along this circular which tells how any consumer may determine just what he is getting:

Prepare solution by dissolving five ounces of commercial copper sulphate crystals "Blue Stone—Blue Vitrol" in 14 ounces of water. The solution should be used for testing when its

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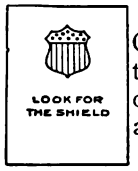
Telephone wire must be well galvanized and capable of standing the following test:

The wire will be plunged into the solution and permitted to remain one minute, then remove and wipe clean. Perform this process four times. If the wire appears black after the fourth immersion it shows that the zinc has not been removed and the galvanizing is well done. If it has a copper color the iron is exposed, showing the zinc is too thin. The corrosion on the wire when taken from the solution is of a copper color, but this is to be wiped off clean and the decision rendered on the appearance of the clean wire.

Some people are happier with boils than without boils.

WESTERN ELECTRIC COMPANY BONDS.



The directors of the Western Electric Company have asked the stockholders to grant them permission to issue bonds to the extent of $15,000,000 alleged to provide funds for an emergency.

Standing alone the foregoing paragraph would mean very little except to Western Electric Company stockholders. Here is an example seldom encountered in financial annals. The Western Electric Company is a perfectly solvent institution. It did a gross business last year of approximately $68,000,000. Its sales thus far this year aggregate something like 85 per cent of the total of last year. It goes without saying that there must be a profit in such enormous business. Sixty per cent of the outstanding stock is in the hands of the Bell Company—which probably owes the concern anywhere from thirty to fifty millions of dollars.

Doesn't such methods suggest a "look-in" somewhere by somebody? The prospective bond issue might have been planned in anticipating such "emergency," but further than that "deponent sayeth not."

And who would take the bonds in the event that the smaller stockholder will have no voice in upsetting the plan scheduled for November 5? What effect will such procedure have upon the present $15,000,000 capitalization?

Surface indications point plainly to a case of sharp practice in keeping with the Bell policy, which always disregards everybody and everything but itself.

We can't change natural laws, but we can bring ourselves in harmony with them.

CHICAGO'S "OTHER" SYSTEM.

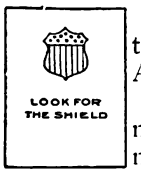
An alderman stood up in the council chamber a few nights ago and innocently remarked that an investigation should be made concerning the "other" telephone franchise that had been given out by the city of Chicago. How astounding! Why didn't some one anticipate such an unlooked for calamity? Why was this man permitted to think so loosely? Right on our desk is a portion of that "other" telephone system. We never use it, and if the gongs would ring it would signal immediate thoughts of dreadful things. We haven't any directory and have very little knowledge concerning the extensiveness of the service.

And it's an Independent telephone, too; a real "look for the shield" affair!

But the alderman's remarks have started something and just as like as not his name will go thundering down in history after the fashion of Paul Revere's Ride, or Perry's, "Don't Give up the Ship." It's really be investigated, of course—it's a serious matter that got started and got stopped. Both times when no one was looking. And now it is quite probable it will get started again when everybody is up on their toes.

Is anybody hanging onto your coat-tails? If they are, take off your coat, and—go on!

AUSTRALIAN TELEPHONE RATES.



A sweeping reduction has been made in toll charges for long distance messages in Australia. Following is the schedule:

Up to 15 miles, new rates 2d. for first three minutes and 2d. for every additional three minutes, old rates 4d. for first three minutes and 3d. for every additional three minutes; over 15 and up to 20 miles, new rates 3d. and 3d., old rates 6d. and 4d.; 20 to 25 miles, new rates 4d. and 3d., old rates 6d. and 4d.; 25 to 50 miles, new rates 8d. and 6d., old rates 10d. and 6d.; 50 to 75 miles, new rates 1s. and 9d., old rates 1s. 2d. and 9d.; 75 to 100 miles, new rates 1s. 4d. and 1s., old rates 1s. 6d. and 1s.; 100 to 150 miles, new rates 1s. 10d. and 1s. 4d., old rates 2s. 2d. and 1s. 5d.; 150 to 200 miles, new rates 2s. 4d. and 1s. 9d., old rates 2s. 10d. and 1s. 10d.; 200 to 250 miles, new rates 2s. 10d. and 2s. 1d., old rates 3s. 6d. and 2s. 4d.; 250 to 300 miles, new rates 3s. 4d. and 2s. 6d., old rates 4s. 2d. and 2s. 9d.; 300 to 350 miles, new rates 3s. 10d. and 2s. 10d., old rates 4s. 10d. and 3s. 2d.; 350 to 400 miles, new rates 4s. 4d. and 3s. 3d.

The rate between Melbourne and Sydney has also been reduced from 6s. to 5s. for daytime conversations and to 2s. 6d. after 8 p. m. The reduction is only temporary, however. It is the intention to make still further reductions after a three months' trial at the new price! It is believed that the expansion of business under this method will popularize the service to the extent of requiring the building of other lines!

This is all very solemnly set down in the belief that it will give our Bell friends nervous prostration.

N-O-W, spelled backward, means WON.

TELEPHONE COMPANY GETS DECISION.

The Home Telephone Company at Fort Wayne, Indiana, has won a practical knock-out against the city, which prevents the stringing of municipal lighting wires on the top of the company's poles.

The contest has been in litigation all summer, the telephone company contending that the lighting circuits would wreck its service. While the victory is in the form of a temporary injunction, the argument has been most thorough, and the court's decision indirectly intimates that the final review of a higher court will confirm the present findings.

To win a reversal of opinion the city of Fort Wayne must prove that its lighting circuits will carry no more current than the circuits of the telephone company, a most preposterous assumption.

The all italic epigrams that we are using this month are taken from *Trumbull Cheer* and the *Silent Partner*. Both publications are always just a bit different than other printed intelligence, and both are free to those who might become prospective buyers of the houses who

History of the Automatic Telephone

By Arthur Bessey Smith

"Now faith is the substance of things hoped for, the evidence of things not seen."—Hebrews 11:1.

THE great things of the world have been the products of faith. The men who have written their names high have conquered by faith in their mission. From Abraham to Edison there is an inspiring record of achievements due to courage. If Cyrus W. Field had not been a man of sublime faith the Atlantic cable might not have become a working reality. If Dr. Alexander Graham Bell had not believed it possible to transmit speech electrically he would not have been able to carry his experiments to their successful conclusion. And the growth of the automatic telephone is more due to faith in possibilities than to anything else.

The importance of ready means of connection for telephone instruments has been recognized from the first. Private party lines soon reached the limit of their service. To converge all the lines at one central point for interconnection was the only way to extend the use of the telephone to meet the rapidly increasing demand. As telegraph lines had been switched by hand for years and was somewhat related to the newcomer in that it also employed relatively weak currents, electricians adapted the plug board to telephone use. From this beginning we have developed to the modern manual switchboard.

In the month of September, 1879, about three years after the invention of Bell's telephone, an application for patent was filed, which covered the first attempt at the automatic switching of telephone lines. The devices described were crude and inefficient, yet they were a beginning. They failed to make it a success. Yet since that time inventor after inventor has attacked the problem. It is a thing which could not be let alone. In spite of the hindrances of unskillful mechanics, their ignorance of electrical laws, and the manipulations of promoters, the automatic system has grown in efficacy and favor. Though men have been wrecked by the wayside, step by step the obstacles have been overcome till but few remain. It is my purpose to trace, as best I can, both technically and generally, the growth of the system, and to throw on the history such side lights as will be helpful from the lives of the men who did the work.

M. Daniel Connolly, of Philadelphia; Thomas A. Connolly, of Washington, D. C., and Thomas J. McTighe, of Pittsburg, Pa., are the earliest known workers in this line. Their first patent was applied for September 10, 1879, and issued December 9 of the same year under the number 222,458. The condition of manual switchboards at that time may be guessed at by the following extract from the patent:

"The operation of making these connections is now altogether a manual work, and requires not only constant attention but much dexterity in order that there shall be as little delay as possible; but in exchanges comprising many members the work of the central office is very great, requiring many employes to meet the wants of the community. Even then there are incessant delays, much confusion, and consequently many mistakes and annoyances which it is highly important should be obviated."

While the drawings in the patent specifications are fairly clear, they are not in the best form for publication to show the essentials of their circuits. Accordingly I have redrawn the scheme in Figure 1. The substation outfit consists of a talking circuit, containing the receiver, a signal circuit containing a polarized bell, and a selecting circuit containing a dial interrupter, a pole-changing switch, and several cells of battery. Two arrangements are shown in the patent, as at station No. 1 and station No. 3. In the latter the dial is entirely in the selecting circuit, while in the former it forms a part of the common circuit and must therefore be normally closed. This point is not definitely stated, though "interruptions" are mentioned as being made by the dial. This indicates that the dial was normally closed, but in selecting a number the circuit was *broken* instead of *made* a certain number of times. The bell was polarized so that positive current must enter at the binding post marked (+) in order to ring it. The reverse current would produce no effect.

The central office switch consisted of a number of wipers, W_1, W_3, etc., mounted on the same shaft. On the end of each wiper was a hook. Arranged in the form of a quadrant around the shaft were a number of contact bars, B_1, B_2, B_3., etc., each bearing as many hooks as there were wipers. Each wiper could be moved around

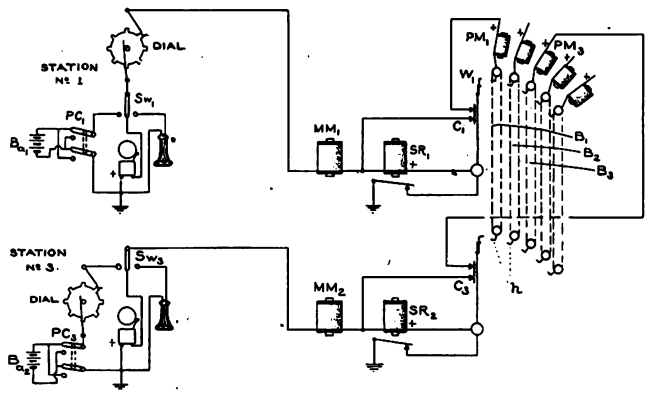


Figure 1.

on the axis and in so doing would engage a hook on each of the bars in succession. *MM* is a motor magnet which could move a wiper by a ratchet and pawl device. There was one motor magnet for each wiper. The line from a station was normally grounded at central through the contact of the switching relay, *SR*, which was polarized as indicated. Its armature was so arranged that it would stay in either position, not returning to its former position unless made to do so by current of the proper polarity, The private magnet, *PM*, was attached to a contact bar, and was arranged to pull the whole bar out of the path of the wipers. It was polarized, and there was one for each bar. It would stay in whichever position placed, the same as the switching relay.

In making a call there were three things which the user had to operate—the switch, *Sw*, the dial, and the pole-changer, *PC*. The switch stood normally on the center point, leading to the bell, and the pole-changer was up, connecting the positive pole of battery to the line. First, throw the switch to the left-hand point, connecting the battery to the line. Second, operate the dial. This interrupted the current and advanced the wiper. In so doing the current took the following path: From ground up through battery, through the dial to line, over the line to central, through the motor magnet, *MM*, through the switching relay, *SR*, to the wiper, through the contacts

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of *SR* to ground. As the current flowed in the wrong direction through the switching relay, the latter would not be operated. In moving along to reach the desired bar, the wiper hooked into a hook on each intervening bar in succession, but passed on without disturbing them. Having arrived at the contact bar of the line with which our subscriber desired connection, he would, thirdly, throw the pole-changer down, thus reversing the battery. This reversal of battery produced three results—it operated the switching relay, *SR*, cutting off the ground at central; it operated the private magnet, *PM*, which pulled the contact bar, B_3, for instance, out of the way of any other wipers which might come around, at the same time carrying the hook on the wiper, W_1, along. The third effect was to ring the bell at the called station. Fourth, the calling subscriber shifted his switch, *Sw*, to the center point and waited for an answering signal from the other party. The called subscriber was supposed to answer by throwing current on the line in such a direction as to ring the calling subscriber's bell without reversing the current through the private magnet and the switching relay. Then they would both switch over to their receivers and talk. At the end of conversation the called subscriber switches back to the bell, while the calling subscriber switches to battery, reverses battery to push the bar, B_3, back in line, and bring the ground back on the wiper by means of the switching relay. The wiper was then free to go to any other line or return home.

Privacy, or non-interference, was secured in two ways. The calling subscriber's line passed through a contact, C_1, between the private magnet and the motor magnet. The first move of the wiper as it starts out to find another line breaks this contact, effectually preventing any other wiper from getting in on that line. The called line is protected by the withdrawing of the contact bar as above described.

There are several "bugs" in the system, which readily appear.

No. 1. It was expected to arrange the contact bars on a portion of a circle, which they called a quadrant. This would limit the number of subscribers very closely. Even if they had arranged a complete circle, the total number of lines possible to be served would be far too small to be practical.

No. 2. The work laid on the motor magnet is too heavy to be handled successfully by current over a long line to a sub-station. The battery to be maintained at the latter point would be enormous.

No. 3. Moving the contact bars back and forth is too heavy work for magnets, especially for polarized magnets, such as the private magnets.

No. 4. It was expected to be able to reverse the line current quickly enough to prevent the motor magnet from responding. This could not be done. The inventors made two suggestions of ways to make it sure. One was to provide a mechanical interlocking device so that when the switching relay, *SR*, pulled up it would block the motor magnet and prevent it from moving. But the same current which energizes the switching relay also energizes the motor magnet. As the latter is supposed to be quick enough in action to follow the impulses of current from the dial, the former would have to be exceedingly quick to pull up and block the motor magnet in time to do any good. The other suggestion was to make the contact on the hooks broad enough to allow the wiper to make one step without breaking contact. It must be noted in this connection that it required several impulses to move a wiper from one bar to the next.

No. 5. It will be impossible to get the answering ring as expected. In order that the positive selecting current shall not ring the bell its plus terminal must be to earth as shown. This must be the case at all the stations. The selecting current will pass from station No. 1 to central, the ringing and switching current will pass from station No. 3 through central to station No. 1. This direction is necessary to ring the bell at No. 3 without disturbing *PM* and *SR*. Now when the called subscriber answers, he must throw his current on the line in the same direction; that is, from station No. 3 to station No. 1. This is the wrong direction for ringing the bell of No. 1. He could ring it by sending current in the opposite direction, but that would operate *PM* and *SR* and sever the connection by grounding the line at central.

No. 6. It would be necessary to talk through four coils, the motor magnet of each line and the switching relay and the private magnet of the calling line. This is too much for good service.

No. 7. There was no provision for release; that is, for automatically returning the wiper to its home position. If the switch had been made in the form of a complete circle it would be possible to return home by going on around the circle. The inventors suggested a complete circle for the purpose of increasing the number of lines, and even thought it possible to arrange the contact bars in a plane, with the hooks or wipers each on a narrow belt running crosswise.

One suggestion of value was to run a separate wire for operating the switching relay and the private magnet, doing away with the reversal of current. This point seems not to have been embodied in the patent. A special application of their switch which the inventors expected to use was in the case of an office with a line to a distant factory. The switch could be placed at the end of the line in the factory and allow the office to pick out and converse with any department in the plant.

But to my mind the greatest obstacle in this system was the high percentage of connections which they insisted on handling. The maximum traffic is when all subscribers are connected by twos. This gives a ratio of cord circuits to lines of fifty per cent. It was this maximum which they tried to retain. Theoretically, it is a good thing for all the subscribers to be able to talk at once, but if telephone companies were to try to provide such facilities, telephone rentals on manual boards would be up in the clouds and the automatic would be an impossibility.

That the inventors themselves discovered the drawbacks of their system to some extent is shown by the development brought out about two years later. August 29, 1881, the same men applied for a patent on an improved system, which was later issued as No. 262,645. In this they show that the difficulty of working the magnets by line current had been found, and they get around it by using relays to control the magnets, the latter being supplied from battery at the central office. Figure 2 shows the essentials of the improved system. There is some discrepancy in the way the station was intended to be wired. In one drawing the strap of the switch, Sw_1, is shown as running to the plus terminal of the bell, as indicated by the broken line at station No. 1. In another drawing it is run to the other terminal of the bell according to the dotted line. Undoubtedly the former, the broken line, is the correct connection, for otherwise the bell could not be rung by an incoming call.

In this system the dial is clearly stated to be normally open. The pole changer, PC_1, is mounted on the dial in such a way that it will be automatically thrown to the reverse position when the impulses have ended. The operations of the subscriber are thus simplified.

The switch at the central office has been changed ma-

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terially. Each contact bar, B_1, B_2, etc., is carried by a pivoted arm, C, at top and bottom, so that it can be swung away from the path of the wipers. In swinging away it can operate a switch which breaks the contact between B and F and connects the bar directly to the line. The wiper arm carries a device called a "line tripper," whose plan is shown at LT_1. The line from the station comes into the switch at F, passes through the contact to the spring B and to the polarized operating relay, OR_1. From here it goes to the wiper arm, P_2, out to the line tripper, LT_1, through its back contact to P_1 and thus to the ground.

At the station Sw_1 is normally kept on its ground point so that calls may be received on the bell. When a call is to be made the subscriber puts the switch in the middle, which leaves it out of contact. The rotation of the dial sends impulses to central, positive current going over the line from the station. The operating relay closes and opens the local circuit of the motor magnet, MM_1, causing it to move the arm by a ratchet movement. The first few impulses of current pass through the operating relay, OR_1, and go to ground through P_1. When the arm, P_2, has advanced far enough, it engages the next contact bar, B_2, pressing it out with a toggle-like movement of its line tripper. This brings the bar into elec-

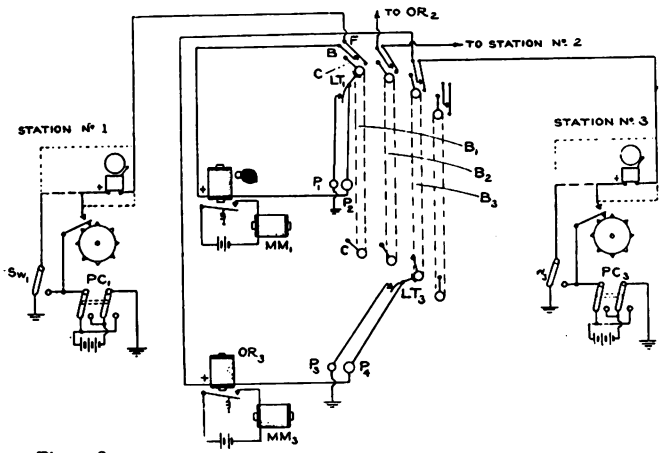

Figure 2.

trical contact with the spring leading to station No. 2, breaking off the connection to the operating relay of that line. At the same time the motion of the line tripper, LT_1, breaks contact with its back spring, thereby cutting off the ground connection. The impulses for further advancement must now pass from the line tripper through the contact bar, B_2, to line leading to station No. 2, and to earth through the bell of that station. As the impulses continue to come, the arm carrying the line tripper goes on, pushing past the bar so that it falls back to its normal position. This restores the connection of station No. 2 with its own operating relay and gives the line tripper, LT_1, its direct ground through P_1. Thus in advancing around the circle the impulses alternately find ground directly through P_1 and through the lines past which the arm moves. When the impulses cease, the line tripper will be resting against the bar of the line sought, pressing it out so as not to be caught by any other line tripper which may be putting up a connection. This removes the ground, P_1, and cuts off the operating relay, OR_3, of the called line, giving a direct line to the called station.

When the dial stops, it automatically throws the pole-changer, PC_1, over and reverses the polarity of the battery. The subscriber now places the switch, *Sw.*, on the right hand contact, which sends current over the line to the called station, ringing the bell. As the battery has been reversed, it will not affect the operating relay. An answering ring was intended to be sent the same as in the first system. Disconnection was effected by stepping on around the circle to the home point.

We have seen how privacy is secured by having the line tripper push the contact bar away from the center so that other trippers can not touch it. But another station might call on the home bar of the calling station if means are not taken to prevent it. A cam is arranged which rests in a notch as long as the arm is in the home position. When the arm starts out to find another line the cam rides up on a disc just enough to hold the bar beyond the reach of passing line trippers, but not enough to break the contact between B and F.

When the line tripper is in its home position it would be expected to be in contact with its own contact bar. This would press the bar out and break the contact B-F, which would cut the operating relay from the line. To prevent this, a notch is cut in the bar opposite its own line tripper, so that it can not be moved by the latter.

By going over the seven objections to the system which were mentioned above when treating the first patent, let us see how many of them have been remedied.

No. 1. We are still limited by the number of bars which can be placed in a circle of reasonable diameter.

No. 2. The motor magnet has been taken from the line and placed on a local circuit where it can have any reasonable strength of current without much expense for battery. The control of local circuits by relays is good and sound.

No. 3. The private magnet has been abolished. In its place is a light, pivoted device which ought to give less trouble.

No. 4. The reversal of battery current has now no effect on the motor magnet as in the first system, as the magnet is now in a local circuit and the operating relay is polarized.

No. 5. The answering ring is no better than before, unless, as the inventors suggest, the ringing current be employed, which is much weaker than that required to operate the operating relay. In this case, the called subscriber could send an answering ring to notify the calling station that he was there. The fancied necessity for the answering signal has entirely disappeared in these days. It must be that telephone subscribers were *exceedingly* slow about answering at that time.

No. 6. The number of coils through which conversation must be carried has been reduced from four to one. This is a very good move.

No. 7. The release is fairly good, though if a step should be lost or gained occasionally, after a time the subscriber might find himself far from home.

A few more troubles have appeared in getting rid of old ones. If wired as shown, the selecting current will ring the bell of its own station, for the polarity of the battery coincides with the wiring of the bell. It would be better to connect the contact point to the line side of the bell, according to the dotted line. In working around the circle the resistance of the working line is very greatly changed. At one instant it is merely that of the calling line, the next it is the sum of that line and the line past which it is moving. In these days of perfected relays this would occasion very little trouble, but relay making was not a finished art then. They had to be adjusted quite carefully for the length of line over which they were to work, and were very sensitive to changes.

October 29, 1881, M. D. Connolly, one of the original three, applied for a patent on improvements designed to overcome the difficulties above mentioned. The pat-

University of Toronto

ent was issued under the number 263,862. The changes are not sufficient to warrant a drawing and are as follows: To equalize the current flow while working around the circle, he introduced a resistance in the ground wire at the central office, equal to that of the longest line. Further he inserted resistances in all lines except the longest to make them of equal resistance. If line No. 7 was the longest line, with a resistance of 20 ohms, and line No. 10 had 14 ohms resistance, he would add six ohms to the latter line to make it equal to the former. This method of getting rid of difficulty by "taking the bull by the horns" has something of the heroic in it. Instead of improving his relays, he equalizes the lines. While it ought to make all lines talk equally loud, it would hardly find favor today. It reminds one of the Thompson-Houston arc dynamo which had a spherical armature of high reactance. To get rid of the excessive sparking at the commutator, a small fan was built into the machine to blow out the arc by a blast of air.

Another improvement which Mr. Connolly made was the insertion of a polarized annunciator or drop in the ground circuit of each line at central. The polarity was so arranged that selecting current would not throw the drop, but if the called line was busy and connection therewith could not be obtained, when the calling station reversed the current to ring, it would throw the drop and let an attendant at central know that something was wrong. The need of a busy signal had been felt, and this was the best that could be done at that time. It had also been discovered that the switch did not always act as desired, and this polarized drop gave the opportunity for reporting or indicating cases of trouble.

A little later (Nov. 8, 1881,) Mr. Connolly changed the polarized drops to common drops in local circuits, controlled by polarized relays in the ground circuits.

The first semi-manual was invented by M. D. Connolly and he applied for patent Nov. 29, 1881. He merely removed the operating relay and put a drop in its place. A push button was placed on a desk in front of an attendant by means of which the arm carrying the line tripper could be moved by closing the circuit through the motor magnet. The subscriber pushed a button on his telephone which sent battery current over the line and threw the drop. The central attendant cut into the circuit, got the desired number, cut out again, pushed the button to operate the motor magnet the required number of times, and let the calling station signal the called. This left the drop of the calling line in circuit for clearing out purposes, after which the operator had to work the button to bring the line tripper to its home position.

This return to manual operation was undoubtedly caused by the recognized imperfections in the apparatus as developed up to that time.

In the short interval over which we have traced the history a number of needs had made themselves manifest to the inventors. They may be enumerated as follows:

1. Relay operation of motor magnets, the latter to be worked by battery at central. The operation of motor magnets by current which must come over the line from the substation is out of the question and entirely impractical.

2. They had begun the introduction of mechanical devices to do the work of at least part of the electromagnetic apparatus. This is shown in the abolishment of the switching relay and the private magnet.

3. Simpler movements for the subscriber. The first system had too much for him to do, resulting in too large a number of mistakes. About the only improvement was in making the shifting of the pole-changer automatic.

4. A better make of relays. As then constructed, they were unduly affected by changes in line resistance. In these days (1907) it is possible to make a relay which will pull up reliably through 1,000 ohms and not stick or "freeze" when closed through a dead short circuit.

5. A busy test, to show the calling subscriber that the line called is busy. This was provided by inserting the polarized signal in the ground circuit to notify an attendant. It was not an automatic busy test.

6. An off normal indication. Switches, like all other machines, will occasionally get out of order and refuse to complete their work. Something is needed to show an attendant that some defect exists, without waiting for the subscriber to send a postal card or call in person with a gun.

7. Skilled attendance. While it may have been thought possible to make an automatic switchboard which could be set to running and allowed to take care of itself, it was demonstrated that attendance was very desirable. It will be noted that even in this day of vastly improved switches some one must be on hand to take care of the little things that go wrong even in the best of exchanges.

The above needs were felt by the early inventors, and some attempts made to fill them. That they were not successful is not their fault. It is indeed wonderful that in the short space of time they brought the development as far along as they did. But there are a few additional points which they apparently did not observe, which have been taught by the experience of the years intervening between their time and ours.

1. The great desirability of getting away from polarized relays and currents.

2. The advantage of working the whole system from one or more centrally located batteries, in place of battery at each station.

3. The answering ring from the called station was useless. It had its origin in the ancient manner of working private lines, as between a house and a store, in which the person calling always waited for the person called to ring back before taking the receiver from the hook. People's motions were slower then than now. The telephone was exceedingly new. They had not become used to its ways. If the telephone bell rang they finished their task before answering it. Now the telephone is answered before anything else.

4. The need for a better release. It is a poor expedient to make the subscriber step his switch around the rest of the circle to get home, for it takes time and brings in the possibility of added errors. The release should be positive in its action, bring the wipers or line trippers home to a fixed stop, wiping out the effects of any errors that may have occurred.

5. The use of one wire with ground return was then the accepted plan. Their switchboard was modeled consistently along this line. Metallic circuits are now known to be the only way to give satisfactory transmission of speech. This would have given them three circuits over which to select, simplifying the switching circuits. But there is a tendency in these days to return to the single circuit plan of selecting, while retaining the metallic circuit for talking purposes.

Attention should be called to the fact that the calling subscriber held the key to the release. The called subscriber could do nothing to get away from a connection till the calling subscriber released him.

(*To be continued.*)

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A Study of Telephone Generators

Showing a Comparison Between Electrometer Methods and the Use of the Oscillograph in Determining the Voltage, Current and Wave Forms of Various Machines

By G. W. Wilder

THE oscillograph is an instrument for instantaneously showing the current or voltage curves of a machine under any set of conditions desired. The theory of the instrument is very simple, and one is inclined to wonder why such a useful contrivance was not thought of earlier. Only within the last eighteen months has the oscillograph been put to any considerable practical

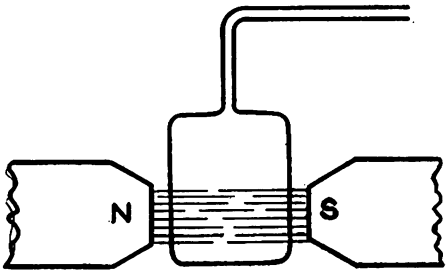

Figure 15.

use, and the field of telephony promises to be a fertile one in researches carried on by the aid of this interesting machine. It is not only useful for the purposes of examining current and pressure waves of generators and motors of all kinds and sizes as used in power, electric lighting and telephone work, but it is also well adapted to investigate these quantities and their changes in circuits containing condensers, impedances and other things which cause a change in the form of the curves.

The principle of the oscillograph is exactly the same as that of the ordinary galvanometer, which is familiar to so many of our readers. Suppose we have a magnet,

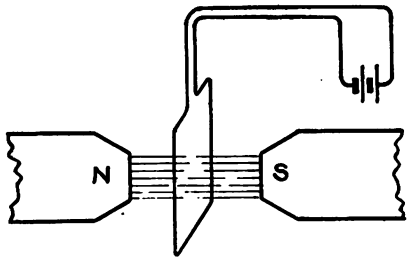

Figure 16.

between the poles of which we suspend a conductor, bent into a rctangular form as shown in Figure 15. Let us further suppose that this conductor is suspended in such a way that its plane lies parallel to the lines of magnetic force which thread across the field from the north pole to the south pole, and that it is free to be rotated to the right or left from this position. We will also assume that whenever the loop is displaced from this position there is a tendency for it to return to this first position.

This tendency may be due to a spiral spring attached to the top and bottom of the loop, not shown in the figure, or it may be due to the rigidity of the two parallel wires being fastened to some rigid support, forming the upper portion of the loop.

Now, if a battery current be supplied to the loop, as shown in Figure 16, the current will flow around through the loop, and in so doing will build up a magnetic field which will oppose the field due to the magnet and react upon it. The result is there will be a tendency for the loop to turn around at right angles to the field of the magnet. It will turn either toward the right or the left, according to the direction we send the battery current. The amount of turning will depend upon the relative strengths of the two magnetic fields, and since the field due to the magnet is fixed, the angle of swing will depend upon the amount of current flowing through the wire loop. By regulating the field strength of the magnet it is possible to make a given current turn the loop through any angle desired.

By using an electromagnet to create the large field, it is possible to regulate the instrument so that a great

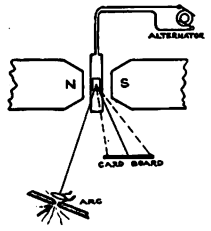

Figure 17.

range of currents will produce the same deflection when passed through the loop. It might be said, however, that for telephone work a very strong magnetic field is necessary, for in nearly all cases the current which is passed through the loop is relatively very small.

Having produced a deflection of the loop in one direction by passing a current through it, we find that the loop steadily keeps in its new position as long as the battery current remains constant in strength. If the circuit is broken, thus stopping the current, then the loop returns to its original position, owing to the spiral spring to which it is attached. Any repetition of the foregoing will again produce a deflection of the loop, and its posi-

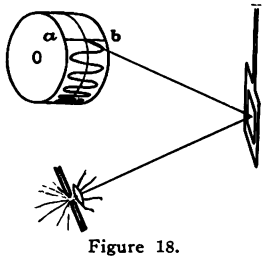

Figure 18.

tion may be governed at will by merely increasing or decreasing the amount of the battery current.

If we now reverse the direction of the battery current we will get a deflection of the loop in the opposite direction, and by passing an alternating current through the loop we will get a constant swinging from one side to the other every time the current in it reverses.

If a small mirror be attached to the central portion of the loop, it will swing back and forth every time the current in the circuit reverses its direction. A beam of

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light, such as may be projected through a lens by an arc lamp, is now thrown on the small mirror in such a manner that it is reflected back upon a piece of cardboard. This is illustrated in Figure 17. Every movement of the swinging mirror is magnified by the spot of light falling upon the cardboard, and as the mirror turns, the spot of light moves across the cardboard. Back and forth it

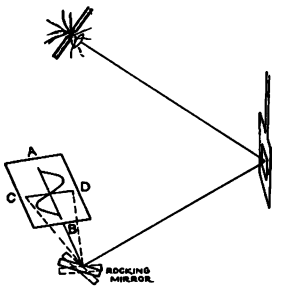

Figure 19.

goes like a pendulum swinging in its arc. When the alternations of the current in the loop become very rapid, the spot of light moves so fast in its journeys across the card that we see only a straight line, the eye being unable to keep up with the individual movements.

Instead of allowing the spot of light to fall upon a cardboard let us place a revolving cylinder in a convenient place and arrange it so that the ray of light from the arc light, after being reflected from the mirror, will fall upon the middle of the surface of the cylinder, as shown in Figure 18. Then, if the mirror be at rest; that is, if there be no current flowing through the loop and the cylinder turns with uniform speed, the spot of light will be drawn out into a line which will encompass

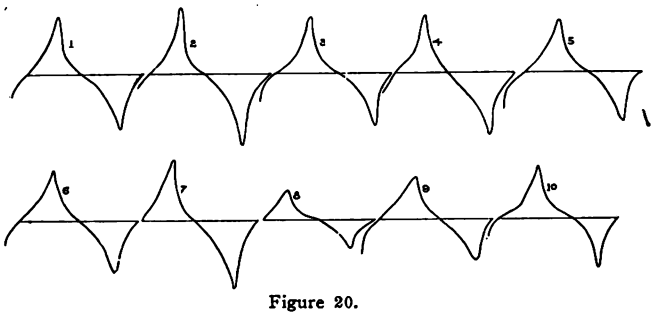

Figure 20.

the middle portion of the cylinder.

If the cylinder be at rest while an alternating current flows through the loop, then the spot of light will move back and forth across the cylinder, making a straight line, *a b*, just as it did in the case of the piece of cardboard.

Now suppose an alternating current to be passed through the loop, and the cylinder to be revolved at the same time. The true motion of the spot of light will be combined, with the result that a wavy line will be drawn on the surface of the cylinder that will represent all of the true characteristics of the current flowing within the loop. By providing the cylinder with a photographic film, a permanent record of any curve may be made. It is necessary, of course, to rotate the cylinder at a speed comparable with the frequency of the alternations of the current, and this is done in practice by using a good motor whose speed can be varied at will. In some cases, such as power work, or electric lighting, where there is considerable energy in the circuit under investigation, some of the current is diverted and made to operate a small synchronous motor. It is impossible to run such a motor in telephone work, however, since the majority of telephone circuits contain too little energy to operate such a machine.

It is oftener desirable to produce curves that shall be visible to the eye, in order that changes may be noted. This may be easily arranged for by the use of a tracing table. Suppose that the ray of light, after passing from the mirror of the loop, be allowed to fall upon a second mirror, which is so placed that it will reflect the light against the under side of a piece of ground glass, as shown in Figure 19. Now, if the second mirror remains stationary, while the loop vibrates back and forth, then the reflected ray will make a straight line *A B* on the ground glass. If the loop remains stationary while the second mirror is rocked back and forth through the position, as shown by the dotted lines and indicated by the arrow, then the straight line *C D* will be produced. When both mirrors are vibrated in unison, the combinations of motions will give the wavy line

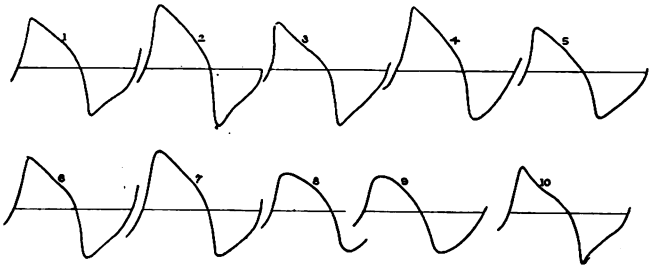

Figure 21.

which is characteristic of the current flowing in the loop. The second mirror is rocked at the proper speed by a separate motor of variable speed. Tracing paper may be laid upon the ground glass plate and the curves traced off by a pencil in cases where the current in the circuit does not change, and the form of the curve remains fairly constant for a few moments.

The oscillograph is well adapted for showing the characteristic curves of telephone generators, and while the instrument does not give actual values of voltage, current, etc., it gives relative values, and shows all of the peculiar features of the curves very nicely. The ten

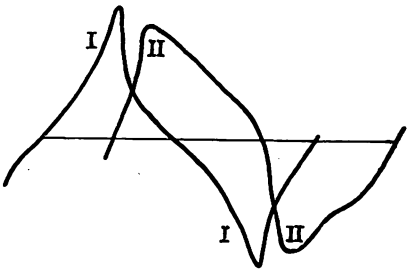

Figure 22.

telephone generators described in the last number of this magazine were tested by the oscillograph and the accompanying curves obtained. The terminals of the machines were successively connected with the loop of the oscillograph, a non-inductive resistance of about 1,200 ohms being placed in the circuit to cut down the current. The resistance of the loop was very low, consisting of a single turn of good conducting metal. The curves shown in Figure 20 are current curves, it being impossible to get true pressure curves on the oscillograph from a telephone generator, because some current is required to operate the vibrator and the current output of the generator is small when working at full load. These current curves, however, are not widely different from the pressure

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curves shown for the same series of generators in our last aticle, as obtained by the electrostatic voltmeter. The differences that do occur are easily explained, when it is remembered that there are many turns of wire on the armature of a telephone generator and that a very small current traversing this wire will, in going many times around the armature core, produce a magnetic field of

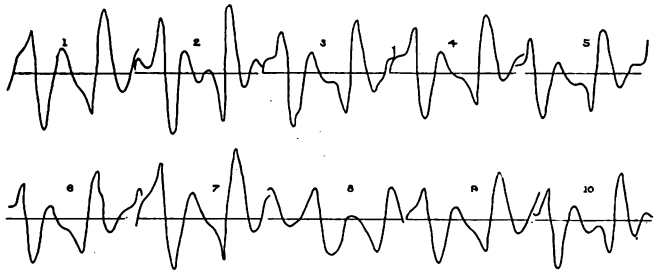

Figure 23.

considerable strength, which reacts upon the field due to the bar magnets. This interference of the two fields creates a distortion which is enough to alter the shape of the original pressure curve. It will be noticed, upon close comparison of the current curves with the corresponding pressure curves, that those of several of the

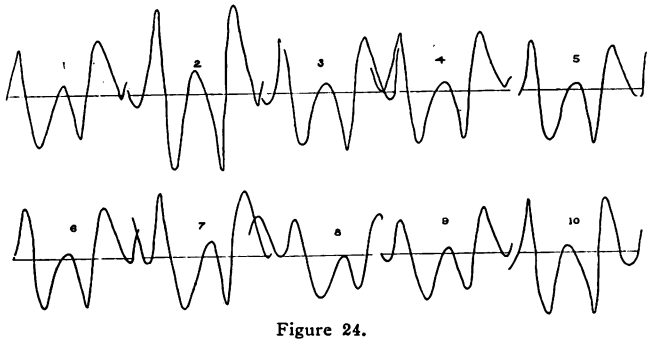

Figure 24.

machines remain practically unaltered, while with others a considerable change occurs. This is because the current output of several machines varied and the distribution of the magnetic field between the pole pieces of some of the machines was such that these were more easily affected by the armature current than the fields of the other machines. The impedance of the armatures is also sufficient to disturb the wave form, and we have

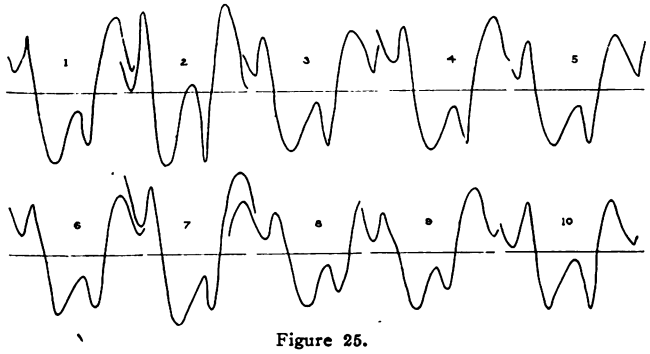

Figure 25.

already seen in a previous article how the impedance changes with the current.

To show the effect of adding impedance to the external circuit a 1,600 ohm ringer was connected in the circuit and curves of the current were then taken from the ten machines. These are shown in Figure 21. It will be seen that the effect of the impedance caused by the ringer coils is to prevent the current from rising until a small interval of time has elapsed, then the rise becomes immediate and suddenly reaches a maximum. This is because any impedance always tends to retard the growth of a current. Also it is seen that on the decline of the current there is a tendency for it to be prolonged in time. This again is another well known characteristic of impedance. Since there are no vertical lines on any of these curves representing their origin, it might be well to illustrate the lag which they suffer by the introduction of impedance of Figure 22. In this instance *I* is the

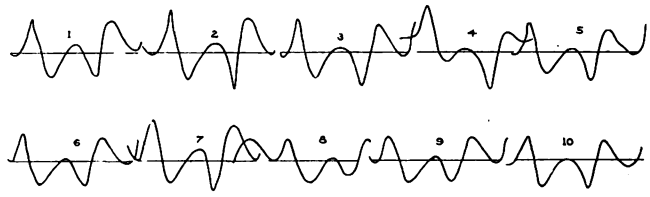

Figure 26.

current curve due to a non-inductive resistance, while curve *II* is that due to the impedance of a 1,600 ohm ringer. The second curve is shifted along the axis toward the right, showing that the impedance prevents the current in the circuit from rising at first until the pressure gathers in considerable force, when suddenly it gives way and the current rushes through, reaching a maximum shortly after getting started. The lagging of the current in its decay is also shown.

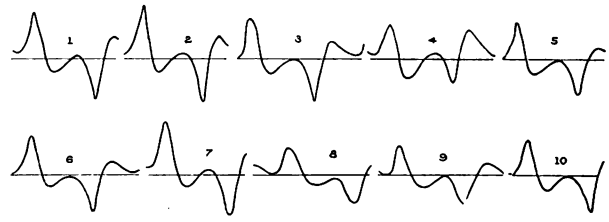

Figure 27.

The addition of several 1,600 ohm ringers in parallel with the various machines do not seem to change the form and character of the curves materially. This is because the impedance of the armatures are high compared with the joint impedances of the ringers when placed in parallel with each other.

When a condenser is placed in a circuit with an alternator the current wave is thrown ahead of the pressure wave and the resultant is a combination which is peculiar indeed. Figure 23 shows the resultant current wave for

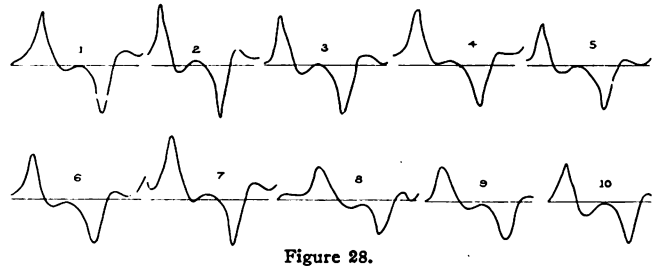

Figure 28.

the ten generators when one 2-microfarad telephone condenser is in circuit. The addition of a second condenser in parallel with the first is shown in Figure 24. Four condensers in parallel are shown in Figure 25.

It will be noticed in all cases where condensers alone are used in the circuit, that the current wave is broken up. With one condenser, it consists of a current having three times the frequency of the pressure wave. By the

addition of other condensers, however, one of the alternations, namely, the middle one, is gradually cut out, leaving a wave of only twice the frequency as the original. Also the amplitude of the maximum points are greater

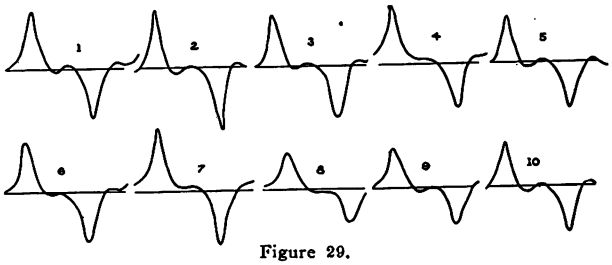

Figure 29.

than in the original wave, which shows that the condenser adds to the pressure of the machine. It has been suggested that the condenser offers a scheme for selective party line ringing, since it adds to the frequency of a current.

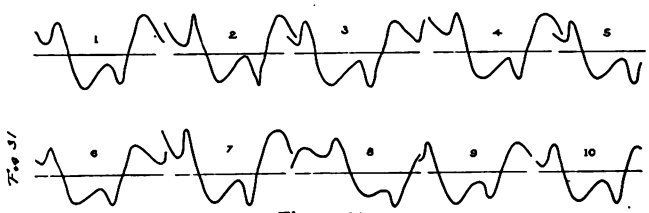

Figure 30.

A ringer placed in series with a condenser gives a form of wave shown in Figure 26. Two sets of ringers and condensers placed in parallel give curves as shown in Figure 27. With three such sets Figure 28 is produced,

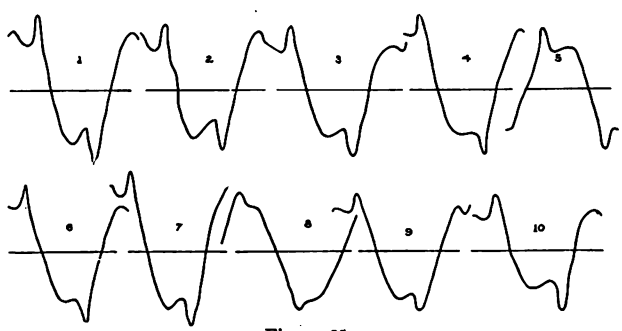

Figure 31.

and four combinations which represent quite a party line of the ordinary bridging kind is shown in Figure 29. It will be noticed that the addition of the several sets of ringers and condensers to the line causes a gradual

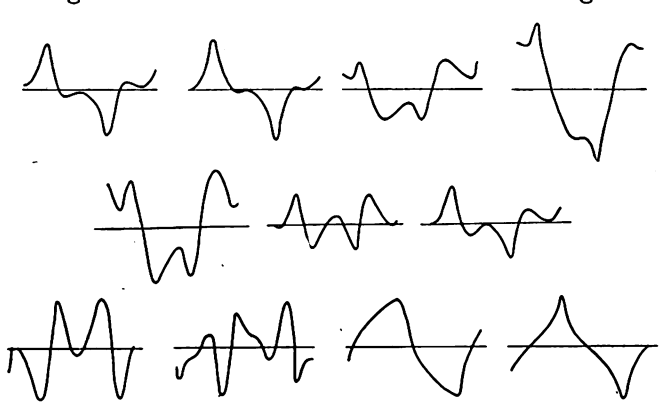

Figure 32.

restoration of the form of the wave to its original shape. This is accounted for by remembering that condenser effects tend to neutralize impedance effects; hence the gradual addition of these quantities to the circuit restore the current wave to its original form. At first the condenser effect predominates, but finally it is lessened, and the added impedances overcome the capacity effect. This is again shown in Figure 30, where two condensers in parallel are placed in series with one ringer. Four condensers in parallel with one ringer in series gives the curves in Figure 31. One can easily see what the effect would be of taking out the ringer altogether by combining these last curves with those of Figure 25.

A set of composite curves formed by taking the average of all the above figures is shown in Figure 32. This may be taken as the performance of the average telephone magneto generator.

The Dream of an Illinois Operator.

Editor SOUND WAVES: The watchman was sleepy that evening and when he came to an old unusued work table in a corner of the factory he sat down on a crate and placed his lantern beside him. On the table was a confused heap of junk. Odds and ends of telephones, old bells, generators, receivers, transmitters, and here they had been accumulating for many years. Through the dusty windows above the bench the moon beams struggled. They glanced feebly from the bells and pieces of plating, seeming to antagonize the lantern's dim rays. The street below was deserted and there was no sound but the quiet rustle of a mouse.

The old man had been most all his life in the telephone business—his side of it—and he was in a meditative mood. "What yarns all them parts could tell," he said to himself as he pulled a crumpled paper from his pocket and tried to read. "What's this?" he continued, as his eyes slowly zigzagged down the column. "Telephone Octopus a-goin' to sell direct to the trade"—but he was interrupted by a subdued chuckle coming from the direction of the work bench.

Surprised, he raised his head and listened. "Don't pay any attention to that," wheezed an old Generator. "We Independents know where we're at."

"I should say we do," replied a scarred and grimy Receiver, "I would be working today, but for this ugly dent a fool man gave me because Central gave him the busy back. I could take more talk than any monopoly Receiver I ever saw!" Loud laughter greeted this sally and nods of approval came from all parts of the bench. "Oh, I don't know," sneered a rheumatic old Transmitter, who bore the escutcheon of the Giant. "What does this Independent business amount to, anyway? It's a case of someone finding a good thing and others trying to get their slice!" "That's it," joined in a rusty Pay Station, with a rattle of springs and levers, "we're all after the coin—that's all." "You're wrong," vibrated a high toned ringer, excitedly, "I stand for a square deal. It's the principle of the thing!" "Is that so," buzzed the Transmitter with irony. "The last time I was talked at I heard a man say to some one: 'O, fudge; John, this dying for principle is all rot.'" "Square deal! Square deal!" shouted the other derelicts of the shop, and the discussion waxed warm. The Transmitter was holding his own, but in the excitement was crowded near the edge of the bench. Just then, the mouse attracted by the commotion, ran across the table, and in his fright bumped into the Transmitter, which fell to the floor with a loud bang and rattle.

"Who's there?" cried the startled watchman. "Well, I'll be hanged if I haven't been asleep!" And with a yawn he got up stiffly and continued his lonely beat through the deserted aisles.—E. I. P.

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Twenty Years of Telephone Development

By Samuel G. McMeen

Reprinted from the Twentieth Anniversary Number of Western Electrician.

ONE way of appreciating what progress has been made in commercial telephony in twenty years is to get before us a general picture of the conditions which existed twenty years ago.

No foreign country has made the advance which has been made in the United States, and it may be well to confine our thought to our own country for the present.

Twenty years ago there were distinctly fewer than 200,000 telephones in use in the United States. No city of under 10,000 inhabitants supported a telephone exchange at all adequate for its needs, and most such cities either had supported an exchange which had declined or had none at all.

Practically all towns having postoffices had at least a toll station, but the limit of "long-distance" conversation was about fifty miles, and the service rather unsatisfactory even at that distance.

Rural lines furnishing service to the suburbs of towns and cities did not exist at all.

The wire plant within and between towns was almost wholly made up of iron or steel wire carried on cross-arms and brackets, and those lines entered the exchanges in most cases by way of house-top fixtures.

These fixtures in the larger exchanges were enormous structures, often occupying the entire roof of the central-office building. The number of buildings owned by operating companies was insignificantly small.

The only general use of cables was in carrying the lines from the roof fixtures to the switching apparatus. These cables joined the outdoor iron wires in a "tower" on the roof, and the point of connection between cables and outside wires was made to serve the purpose of a main distributing frame.

The outside lines and the office cables were all of a single wire per line, as all telephone currents used the earth as a return.

Protective mechanism was limited to a sawtooth open-space lightning arrester or its equivalent; such arresters occasionally stopped lightning charges of moderate strength.

Sub-station equipment was more nearly in a standardized condition than today. It is true that the standard was bad and that each set had defects rather clearly recognized at the time, but if there be an advantage in uniformity, it existed at that time. The telephone receiver was of the single-pole type and was associated with a Blake transmitter. The latter utilized a solid carbon button with a polished face, bearing against a rounded platinum stud. A black walnut box, with a hole in the door for a mouthpiece, contained the transmitter and the induction coil.

The central office was called by a magneto generator, and signals were received, as now, on a polarized ringer, the resistance of which was uniformly about 80 ohms. When a number of stations occupied one line, all the ringers were connected in series. The switch contacts of the magneto-bell outfit were innocent of platinum at any point.

The current for the transmitter was furnished by a single cell of Le Clanche battery.

The amount of maintenance labor to be spent on such lines and such sub-station equipment need not be called to the mind of the older telephonists, as most of them would rather forget than remember. It may be appreciated in a degree by those who have entered telephony in a more fortunate time, when it is said that the life of galvanized-iron wire varied from three to seven years, and that the number of opens, crosses and grounds on a rainy day often reached 20 per cent of the total number of lines in an exchange admitted to be fairly well managed. To this had to be added the attention necessary to keep local batteries renewed, transmitter buttons cleaned and polished, transmitter tensions adjusted, and switch-hook contacts cleaned. If the latter were not done, and well done, the subscriber would be entertained by a continuous sizzling, frying noise, often great enough to prevent commercial conversation.

Of the central office equipment, it may be said that it was robust enough to give as little trouble as any equipment that has been devised since. The multiple switchboard with an audible busy test was well established, and all of the larger cities were so equipped.

Compared with the simpler transfer switchboard, however, the multiple outfit was costly; and, in addition, a royalty had to be paid on the multiple feature itself. It resulted naturally that there were many fewer multiple boards in the country than good service really was demanding.

The multiple switchboards were varied in type, some having operators' equipments consisting of pairs of cords with listening and ringing keys and others having a single plug and cord per line, each line having its own listening and ringing outfit associated with the cord. These single-cord boards had many advantages assisting speed of operation, and records have been made on them which compare more favorably with what can be done today than would now be imagined. This speed was due, however, not to a convenient and positive system of signals to indicate the state and progress of the call and connection, but to a mechanical arrangement of the keys and cord circuits, which reduced the motion required to make the connection and the disconnection.

The nearest present-day counterpart of a single-cord switchboard is a manual incoming trunk section. If one of the early single-cord boards could have been equipped with automatic signals, such as now are possible, there is no doubt that its performance would have been still more remarkable. But the single-cord type of subscribers' switchboard ceased to be made when metallic circuits succeeded the single-wire line.

In the foregoing I have tried to picture the general aspect of conditions twenty years ago. It is true that metallic circuits were not wholly unknown. The granular carbon (Hunnings type) of transmitter was in sight. It was recognized that platinum contacts must be introduced for hook switches, and that it would be well to improve or abandon the primary local battery. A few traction systems had appeared and the first steps toward curing the difficulties so introduced were being taken.

What has happened since then in the commercial development of the art can well be shown graphically, and I have prepared a diagram stating what probably are the

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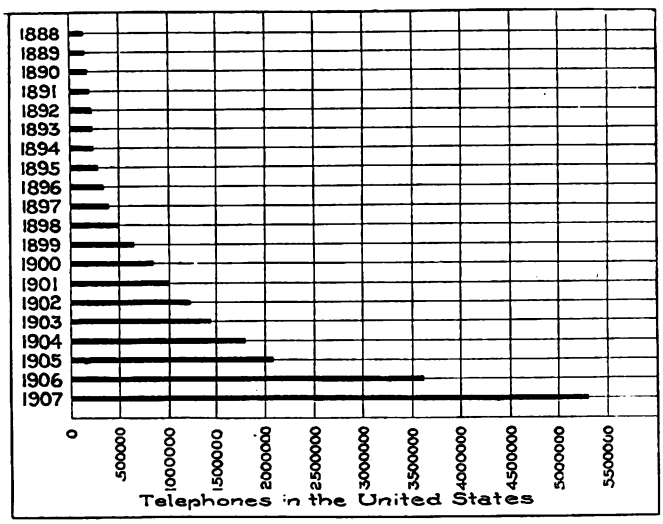
facts as to the number of telephones in the United States year by year. It shows that the number twenty years ago was smaller for the United States than for Manhattan Island today. It shows the leisurely growth for the first eight years and the remarkable acceleration since, and it may be that it indicates what we may expect in the future.

If similar diagrams were to be drawn for the growth of long-distance conversations, they would show that the limit of fair commercial transmissions has been increased over 2,000 per cent; that the rate of growth in interurban wire mileage is as remarkable as the growth of telephones in use, and that the conversation-miles per inhabitant per annum have increased at a rate beyond either.

The causes which have stimulated growth in telephone development since 1895 are more than the expiration of the basic patents and the appearance of competition. Probably this competition has been the most powerful cause, but there are mechanical reasons as well. Principal among these are the rearrangement of things which has reduced the complication of the subscriber's telephone and increased that of the central office equipment; the changes in methods of line construction, the introduction of automatic switching equipments, and of



manual switchboards with automatic signals on line and cord circuits.

I have spoken of the early multiple boards as being robust when of the type first introduced. Somewhat less than twenty years ago, however, as the number of subscribers' jacks required to be placed within a section within the operator's reach began to become very large and the spring pressure per jack to grow small, the presence of series contacts in such jacks introduced a new and serious trouble. A good many ways of reducing or avoiding this trouble were tried, but the solution most successful was the entire elimination of all contacts required to close the line through the jack on the withdrawal of the plug. A rearrangement of circuits was necessary, resulting in the "bridging" or "branch terminal" switchboard, with automatically self-restoring and locking drops.

Many such switchboards were installed, most of them being equipped with the additional refinement of an intermediate distributing board, enabling the traffic of the office to be readjusted from time to time so as to even up the work of the various positions.

In an effort to avoid the large cost and royalty expense of multiple switchboards, there was produced on the Pacific coast, at about the time of the advent of the bridging multiple board, a local trunking or transfer switchboard, equipped with automatic signals. Its performance aroused sufficient interest to cause its operation to be studied in detail, with the discovery that the important advantage lay not so much in the use of local trunks, or transfer circuits, between parts of the switchboard (as a substitute for a multiple of the lines) as in its use of automatic signals. It was then but a simple step of logic to the conclusion that if automatic signals were to be applied to the multiple switchboard a maximum of advantage would be gained.

At that point the present type of common battery multiple equipment came into existence, and what has been done since upon it, while of great value, has not been revolutionary in any way.

The conditions required for the operation of automatic line and supervisory signals fitted in so well with the requirements for supplying the subscriber's transmitter with current from the central office that common battery transmission came into being almost as a matter of course.

The earliest commercial installations of automatic switching equipments were made before the expiration of the basic telephone patents, and the early development of the automatic art was about contemporaneous with that of the branch terminal magneto board. Viewed in the light of total accomplishment, the development of automatic switching equipment is quite as remarkable as any other phase of the art; and more so in view of the strong prejudices which had to be overcome, the continuous discouragements which were met, and probably the difficulty of prosecuting the development with so little support from the telephone-consuming public.

It is interesting to note that while in manual telephony the present grade of central office service only has been reached by abandoning the local trunking system and adopting the multiple system, in automatic telephony the opposite is true.

The earlier automatic equipment were all of the multiple type, and the large automatic equipments of today only are possible because the multiple feature has been discarded and the complete local trunking arrangement adopted in its stead.

With an equal possibility of a high quality of voice transmission; with the marked advantage of instantaneous disconnection; with the ability to handle the largest groups of subscribers' lines and to care for private branch exchange service, an automatic system is to be considered one of the great certainties of future telephone equipment.

The principal changes in substation equipment in twenty years have been the provision of platinum contacts; the change of ringers from a low-resistance series type to the high impedance bridging type, and the provision of a granular carbon transmitter free from the tendency to pack and with a great range of resistance change when spoken into. The adoption of the bipolar type of receiver also has improved the equipment in a small degree.

Just as metallic circuits were a rarity twenty years ago, so grounded circuits are the rarity today. The reasons for this radical change, practically doubling the wire plant for a given number of lines, were three.

One of them was the arrival of electric traction, whose return currents made telephone lines extremely noisy and caused unbearable false signals; another was the limit placed on long-distance speech by the noises in grounded lines from earth currents and atmospheric charges; the third was the cross-talk between neighbor-

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ing lines when carried as grounded circuits in cables of more than a few hundred feet length.

This rather complicated group of reasons is a fairly good instance of the causes of change in all branches of telephony.

The McCluer system of common wire returns as a substitute for ground returns helped out the electric-traction difficulty very usefully, but was of no advantage in solving the other two problems. The enormous masses of open wires in the streets were causing the operating companies to wish, and the municipalities to demand, some other method of distributing telephone lines. After a short time of denying it to be possible, the inevitable underground system appeared, and there are more telephone wires in the earth today than there were above it a dozen years ago.

But even with a pair of wires shut up in a cable within a lead sheath in a duct in the ground, with all external disturbances excluded, the line problem was not solved. Indeed, a new difficulty had been introduced. This was the substantial increase in the electrostatic capacity of the two wires forming the line, and with the clearly articulating but low power Blake transmitter the short-circuiting effect of this capacity amounted to a very hurtful loss. A solution of this new problem came in the paper-insulated, highly aerated telephone cable of present practice. A still further and most admirable solution was contributed by Dr. Pupin, which inserts an inductance in series with each wire of a pair to neutralize the effect of the capacity across it.

The effect of such a series of inductances upon the electrical voice waves is so similar to the effect of a molar loading of a light string upon "string waves" that the treatment of a telephone line by Pupin inductances has come to be called "loading."

Lines in a given cable can be worked for greater lengths at a given loss when loaded, and the result is a new series of economy factors in laying out the many central offices of a city, and the adoption of underground instead of aerial long-distance trunks between cities many miles apart. As a matter of comparison it may be noted that it is possible to talk farther through an underground cable of small copper wires today than one could talk over an open aerial circuit twenty years ago. It is not apparent why all interurban trunks ultimately may not be placed in the earth.

The advantage of an entire underground system of loaded trunks between cities is not merely a reduction of interruptions and the elimination of pole decay. The principal gain is in the nearly uniform hurtful capacity effect to be cured and the almost absolute certainty of uniform transmission.

Inspired by the success of repeaters in long telegraph trunks, a telephone repeater for a similar assistance has been dreamed of. One inventor seems to have remembered the dream after waking, as the commercial success of the Shreeve repeater has at least shown that a repeater is not impossible. Whether the perfected repeater will co-operate with line loading on long circuits, supplant it, or render it unnecessary, furnishes an interesting field for speculation.

The operation of telegraph and telephone service over the same wires in the same time, in successful operation for many years past, has had the effect of reducing the financial burden which long-distance telephone circuits otherwise would need to carry. It is now possible, under favorable conditions, to work each side of a long-distance pair quadruplex and the pair itself for speech.

ment in telephony should omit to note the opportunity of a switching system combining the best features of manual and automatic equipments; the very valuable investigations in electrical acoustics made possible by the use of the oscillograph, and the recent advance in radiotelephony through the use of energy in the form of Hertzian waves.

I have confined my attention so far to conditions in the United States. Growth in other countries has been less rapid than here, and in the main the methods and appliances less well developed. For some years, however, Sweden led the world in density of development of the larger cities. This is not now true, as there are a number of American cities with a ratio of telephones to population greater than in any Swedish city.

The literature of telephony is an excellent index of the progress which the art has made in twenty years. The telephone man's library of long ago consisted of a single volume, written by the dean of telephone engineering, Mr. Thomas D. Lockwood. Today a library of telephony occupies several shelves, and one may receive half a dozen periodicals exclusively devoted to the art.

International Independent Telephone Association.

No Compromise.—At practically every state and provincial association meeting held since the Chicago convention, resolutions have been adopted endorsing the stand taken by the International Association in denouncing connection of any sort, for any purpose, with the Bell system, and indications are that similar sentiments will be expressed at Independent gatherings now being arranged. This is encouraging, as a proof that the Independents of the United States and Canada realize their strength, and recognize the folly, not to say danger, of any affiliations which would tend to weaken their position, by permitting disintegrating influences to creep into their ranks. Leaving sentiment entirely out of the question, in view of the fact that the Independents' progress has been made in the face of the most determined opposition by the interests now proposing alliances, common sense would dictate a strictly independent policy as the safest course for the Independent interests, now that they have the situation in their own hands. "No compromise," is a good slogan.

Helpful Methods.—Officers of the Missouri Association are sending out a series of very strong, helpful, encouraging letters to their members, which have been productive of great good. The Ohio Association prepares complete, detailed statistical reports of the situation in that state at the end of March and October in each year, furnishing copies free to its members, to be sent out to their stockholders, bankers, prospective investors, and for use in advertising. The Michigan Association has just issued a neat handbook of general information, regarding the telephone situation, for the use of its members. Similar books were issued by the Nebraska and Indiana Associations last year. The foregoing are merely cited as examples of concrete methods by which the various state associations can strengthen their organizations and assist their members. We would like to hear from the officers of any state organization regarding methods which have proven particularly helpful. Pass a good thing along!

Use Your By-Products.—Many progressive Independent telephone companies are prone to overlook the possibilities of directory advertising. For a number of obvious reasons, space in telephone directories is particularly valuable from an advertising standpoint. With

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siderable income from this source, often sufficient to leave a profit, after paying for the cost of publishing directory, without any sacrifice of dignity or interference with the purpose for which telephone directory is issued. This matter is worthy attention. Make your directory at least pay for itself.

Financial Statement.—Apportionments by Executive Committee for 1907-8:

ASSOCIATIONS.

Arkansas	$ 100.00	
California	300.00	
Canada	25.00	
Illinois	750.00	
Indiana	1,000.00	
Iowa	700.00	
Kansas	400.00	
Kentucky	200.00	
Maine	25.00	
Michigan	750.00	
Missouri	500.00	
Nebraska	350.00	
New York	300.00	
North Carolina	25.00	
Ohio	1,300.00	
Oregon	40.00	
Pennsylvania	500.00	
Texas	100.00	
Vermont and New Hampshire	25.00	
Virginia	50.00	
West Virgina	250.00	
Wisconsin	250.00	
		$7,940.00

CONTRIBUTIONS AND PLEDGES.

Swbd. and tel. mfrs.: Equipt. stamps	$6,500.00	
Mag. tels. and drops	$4,000.00	
C. B. tels. and drops	2,500.00	
Supply dealers and jobbers	5,000.00	
Engineers	250.00	
Journals	500.00	
Operating companies (paid in July, 1907, $235)	750.00	
		$13,000.00

GENERAL.

Honorary membership fees (paid in 1907, $50)	$ 750.00	
Miscellaneous accounts	671.74	
		$ 1,421.74
Total		$22,361.74
Paid in		285.00
Balance to be collected		$22,076.74

Annual assessment 1c per unit. A unit is an operating telephone or a circuit mile of toll line. Assessments are payable monthly, and are based on number of units in respective associations at last convention.

FISCAL YEAR, 1906-7, CLOSED MAY 25.

Total receipts this year to date, including special committee, balance	$12,847.94	
Total expenditures, including accounts accrued before last convention	12,364.46	
		$484.48
Accounts payable	$ 333.05	
Estimated expenses for next thirty days (publicity department not started)	420.00	
		753.05
Deficit, October 16		$ 268.57

N. B.—The Association should have a fund of $1,500 per month for the next eight months for publicity purposes and $1,000 per month for strengthening and extending the organization. Nothing will be done by the present administration until necessary funds are pledged to defray the cost of the undertaking.

Arbitration.—Division of territory is a subject which often demands the attention of state and district meetings. In order to properly handle this subject, and settle disputes which, for any cause, may arise from time to time, each association should have its arbitration committee, with definite rules of procedure and power to act authoritatively on cases brought before it. Copy of arbitration rules adopted by the International Association, and those in use in a number of states, may be had free, upon application to the Cleveland office.

Shield Advertising.—Are you giving this important subject the attention it deserves and taking advantage of the discontinuance sale of the supply department? We have sold out entirely of a number of the shield supplies, but have enough of others left to take care of orders of early applicants. Colonial lanterns and large transparencies are particularly good values at present prices. Get yours while you can.

Identify Your Company as Independent.—Make the people realize that there is a great Independent system, of which the various local companies are a part. All local people should identify their company as "Independent." Individuality is indissolubly bound up with the general welfare of the movement. Use the shield as the main emblem; it's important.

Telephone Vibrations.

R. Kempf-Hartmann published recently the results of a lengthy investigation of the vibration of telephone membranes, undertaken with a view to clearing up the disturbing noises attending the telephonic transmission of sound. The telephone problem is that of receiving a series of variations of the density of the air at one point and faithfully reproducing them at another point. The practical solution is somewhat indirect, and consists in converting the changes of density into vibrations of an elastic disk, and producing them by electro-magnetic means.

This introduces complications due to the natural vibration of the disk such as would not exist if the transmitter were, say, a small gas jet, whose variation with the pressure was transmitted with the aid of a selenium cell. The author recorded the vibrations of a telephone diaphragm by means of a mirror stuck to it, and an arrangement of an arc light, a point diaphragm, a system of lenses, and a revolving cylinder of sensitive film.

The first point investigated was whether a note received by the diaphragm gives rise to a corresponding series of vibrations of the diaphragm at once, or whether the vibrations only gradually fell in with those of the air. The photographic traces of a tuning fork note show that the reaction is practically, instantaneous, the "period of latency" not exceeding 0.0005 second. The maximum amplitude is attained as soon as two full periods have passed through. After that the curve for a constant sound remains remarkably steady.

When the note ceases, the proper vibration of the diaphragm persists long enough to be seen or even heard, but it is greatly damped by a rubber plug attached to the centre of the diaphragm. It also appears that the overtones which produce the rattling and clattering noises in the telephone, are the more prominent the greater the amplitude of the diaphragm. This is contrary to what happens in reeds and strings where the fundamental note becomes more prominent the greater the force with which the note is sounded.

As regards the comparative sensitiveness of the eye and ear, the author mentions that, generally speaking, the records show a sound whenever a sound is heard, and vice versa. In traces of complete words, however, the records show a number of details which are quite beyond the perception of the ear. He gives some interesting curves representing vowels and consonants, which are reproduced with the finest detail.

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Some Questions Answered

By Arthur Bessey Smith

Instructor of Telephone Engineering, Purdue University.

Editor SOUND WAVES: On page 151 of your September number is given a table showing the efficiency of a certain generator under varying magnetizations of the field magnets and the statement made that "the electrical efficiency is not materially changed." A little consideration will show that the electrical efficiency is independent of the magnetization of the field magnets and can be found as the ratio of the armature resistance to the resistance of the whole circuit, instead of calculating the watts generated, watts delivered, and watts lost as is done in the article.

With any magnetization, the open circuit voltage of the generator is a linear function of the magnetization, consequently where M is the magnetization, and E the E. M. F. on open circuit,

$$E = KM$$

where K is some constant depending on the speed and turns of wire in the armature. For a circuit of resistance R, the current would be

$$I = \frac{KM}{\sqrt{(R+r)^2 + \omega^2 L^2}}$$

where r is the armature resistance, L its self-induction, and $\omega = 2\pi \times$ frequency. Then the total energy delivered by the generator would be

$$I^2(R+r) \text{ or } \frac{K^2M^2(R+r)}{(R+r)^2+\omega^2L^2} \qquad (1)$$

The energy delivered to the external circuit would be

$$\frac{K^2M^2R}{(R+r)^2+\omega^2L^2} \qquad (2)$$

Dividing (2) by (1) to get the efficiency gives

$$\frac{R}{R+r}$$

This value is independent of the magnetization. Incidentally one notes that

$$\frac{2000}{2000+515} = \frac{2000}{2515} = 79\%$$

or that the external resistance, 2000, in the example given by Mr. Smith, divided by 2000 + 515, the total resistance of the circuit gives 79 per cent, the efficiency obtained by a much longer method.

In this it is assumed that the self-induction of the armature does not change and the agreement of the three examples worked shows that this assumption is practically correct.—A. F. P.

We are glad to print the above addition to the matter contained in last month's article. In preparing any matter for publication, there are usually several methods of presentation, and the writer must choose the one which he thinks will be the most clear to the largest number of readers. The relation worked out by the correspondent is true when one knows that his voltage is a linear function and that the inductance of the armature is constant. But in general, it was thought best to present the idea of the generator's efficiency by showing the total amount of power generated, and accounting for its disposition.

Editor SOUND WAVES: Kindly advise me through SOUND WAVES whether I have the right idea of frequency as per sketch. Does the secondary of an alternating lighting circuit have double the frequency of the primary circuit? With the proper induction coils, this arrangement (Figure 1) seems to talk in the ordinary way, but if I am correct, would not each wave (sound) be double and appear as high-pitched talk in the receiver?—W. P. S.

The fact that a test of the coil arrangement gave an ordinary talk would show that there was no change in frequency. No matter how often alternating current is put through induction coils, or transformers, or repeating coils, the frequency will remain unchanged. In circuit No. 1 of Figure 1, the current will rise and fall somewhat as at A in Figure 2, if the circuit is controlled

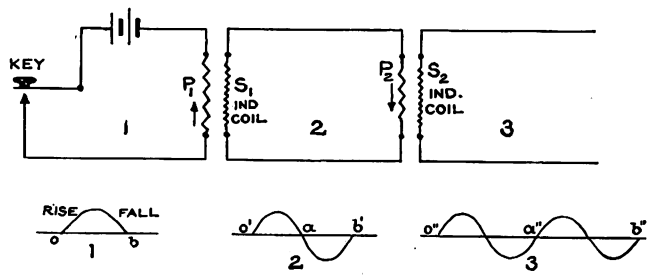

Figure 1.

by a key and is made and broken at regular intervals. During the rise of current, an E. M. F. will be induced in the secondary of the induction coil No. 1 opposite to the direction of the arrow. During the fall of current the induced E. M. F. will be in the same direction as the arrow. This will cause an alternating current somewhat like B in Figure 2. This current flowing through induc-

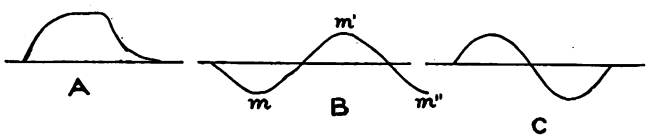

Figure 2.

tion coil No. 2 will act as follows: During the rise from m to m' it will induce an E. M. F. in the secondary opposite to the direction of the arrow. During the fall from m' to m'' the E. M. F. in the secondary will be in the same direction as the arrow. This will result in an alternating current somewhat like C.

Editor SOUND WAVES: In your opinion would transposing two parallel grounded lines have any effect on the cross-talk between them?—C. B.

As long as there are only two lines, transpositions will not affect cross-talk. If there were a dozen lines, transpositions would have a tendency to *equalize* the cross-talk, but would not kill it out. But with two lines there is no way to get rid of cross-talk except to make one of them metallic or separate the wires.

Editor SOUND WAVES: Can you suggest some remedy for us to get rid of our line induction, or at least some relief from our trouble? We have one line that runs almost parallel with the electric wires. The hum on it is so bad when the lights are on that we can hardly hear anything on it. It is a single wire line. We do not want to make a metallic line out of it if we can get any relief any other way. Could we use insulated wire for the line and get four or five feet from them and get any good of it?—E. M. C.

There is no sure remedy for noisy lines when caused by power circuits unless you get clear away from them or make the telephone line metallic. Using insulated wire will do no good, for induction works as well through the insulation as through air. If you have 2,200 volts or more on the lighting wires, you will have to get more

than five feet away to get relief. Get on the other side of the street if you can. There is a possibility that the electric light people have a ground on their line. This will make your telephone line very much worse. Make a test of this point and it may help you. If it does not, bring the noise down to a usable point, and if you can not get away from the lighting wires a metallic circuit is the only thing that will save you. It will be money well spent to begin making your lines metallic, even if you have to charge a small extra rental to do so.

Editor Sound Waves: Will a receiver with one coil wound in one direction and the other wound in the opposite direction respond to speech as well as when both coils are wound in the same direction? I received a statement to the effect that there would be no sound when placed to the ear from the receiver with the coils wound in opposite directions. Have you ever tried the above experiment, and what was the result?—M. C. F.

If this experiment be tried with an ordinary receiver the chances are that you will hear a very weak sound. This has been my experience. I once reversed one of the coils of an Ericsson receiver. The sound, which had been clear and loud before, was now very weak. If one coil had been the exact electrical duplicate of the other, the probability is that no sound would have been heard. But it is next to impossible to produce coils which have *exactly* the same effect on the permanent magnet, hence, if one is a little stronger than the other, it will predominate just to that extent. This is also verified by the work of those who have made differential receivers, it being a very delicate task to adjust the two coils to be exactly opposite.

Editor Sound Waves: In some receivers which I have repaired I find the bare magnet wire wrapped around the bare iron core of the electromagnet and these receivers were satisfactory. Why not make the ringer movements the same way by wrapping the base wire around the iron core to make the inside connection of the electromagnet coils? It does work in the receiver. Why won't it work in the ringer movement?—O. H. D.

This method of construction is new to me. I can not say that it looks good, for wherever iron is there is the tendency to oxidation. There is less oxidation in the interior of a receiver coil than many other places, for the receiver must be dry to a certain extent or it will not work properly. Yet I should fear that in a few years a slight coating of oxide would form on the iron, which will surely interpose needless resistance in the circuit. Copper against iron only makes it worse. The same will hold true in the case of the ringer magnet.

Editor Sound Waves: In testing induction coils and receivers, I put the receiver in series with the secondary winding of the coil, then send a current from a battery of two dry cells through the primary winding of the coil. There is a loud click in the receiver if everything is right, when the current passes through the primary coil, and when the current is broken there is another click. Is there a better test and how is it made?—C. M. S.

The test which you describe is a very good one. The user must, of course, be acquainted with the action of good coils and receivers so as to be able to judge if the click is loud enough. It might be better to use only one dry cell, for it will give a click in this case which is loud enough. In fact, if the noise is not quite so loud you will be better able to judge of its loudness. A very good test is that shown in Figure 3. *AB* is a slide wire of No. 22 or No. 24 German silver wire, several feet long. The free end of the receiver cord, *W*, is adjusted to the point at which a faint click is barely heard when the key, *K*, is closed or opened. A good receiver will come very close to *A* before the sound vanishes. A better test is that shown in Figure 4. Ringing current is passed through the secondary of an induction coil, with a 2-M. F. condenser in series and another

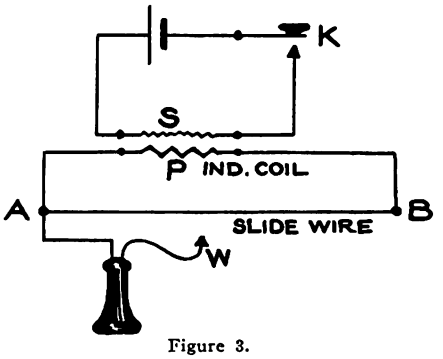

Figure 3.

shunted around the secondary. The receiver is connected in series with the primary and a lead pencil resistance. The latter is made by rubbing a lead pencil on a hard wood board so as to make a long, narrow line about an eighth to a quarter of an inch wide. One end of the line is made broader than the rest and a hole bored through to take a binding post which is to form one terminal of the resistance. The free tip of the receiver cord may form a stylus. Run it along the pencil resistance till you

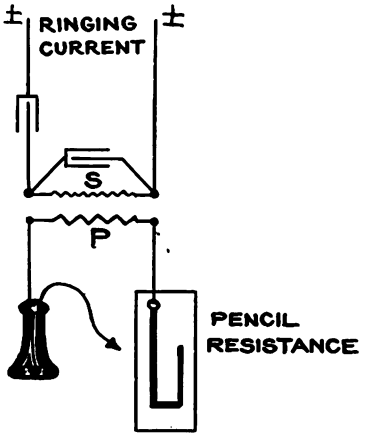

Figure 4.

find the point at which the sound of the ringing current can be no longer heard. Test several receivers so that you know how the good ones and bad ones run. They will vary considerably. The two condensers are for the purpose of reducing the loudness of noise to a reasonable limit, as is also the step-down effect of the induction coil. The quietness of the room will affect the results.

Editor Sound Waves: How do you install a single stroke bell to work in series with a vibrating bell? I have tried to make it work, but the single stroke bell refuses to pick up and ring steadily and reliably. It is very spasmodic. If you can give me any hints as to how to make it work I will be much obliged.—L. T. L.

To work harmoniously, the single stroke bell must be in tune with the vibrating bell. It is depending on the latter for making and breaking its current and its natural period of vibration must accord with the speed at which the vibrating bell runs. If the single stroke bell tends to run too fast, it will have completed its swing one way and have started back before the current is

broken by the other bell. Thus part of the impulse of current opposes its own action and tends to undo it. Tighten or loosen your springs on one or the other of the bells till you have them in tune.

Editor SOUND WAVES: Will you kindly inform me or give me an idea how to wire a Warner pole changer to give both alternating and pulsating current? If it is not too much trouble would you make a circuit of the same?—N. W. J.

The circuit for which you ask is shown in Figure 5. The only change which has been made is to add a tap on each end of the main ringing battery. I have omitted from the sketch the battery which keeps the vibrator moving, as it does not enter into the workings of the

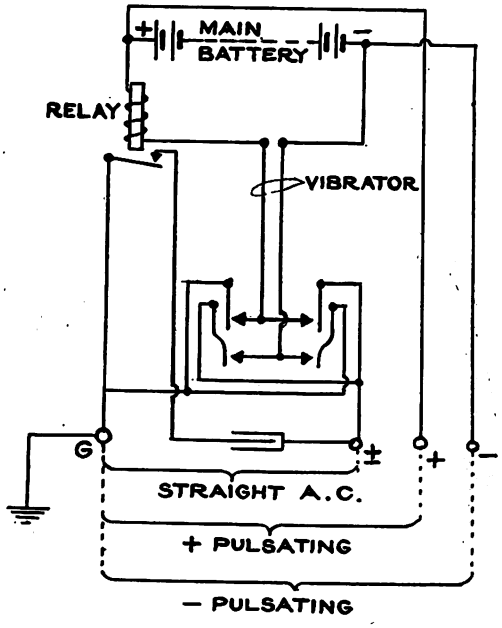

Figure 5.

ringing current. This will not bring the condenser into play when ringing with pulsating current. It would require two more relays and two more condensers wired into the two new circuits the same way that the regular one is wired.

Editor SOUND WAVES: Can a telephone be worked on a 500-volt trolley line? I mean, can it be attached to the trolley wire, using the rail for return, and talk over it along the line. If so, what apparatus would be required?—G. W. L.

That depends on the conditions. If the main switch at the power house is open—no voltage on the trolley—you could talk as well as on any grounded line. But I judge you mean while the voltage is on. While it might be possible, it is highly improbable that any means could be devised to allow conversation. Condensers can be built which will withstand the voltage, but the natural noise due to the running of motors would doubtless be so loud as to make talking out of the question. Then there is the ever-present possibility of something breaking down and letting the full voltage come on the telephone apparatus.

Editor SOUND WAVES: Why is the cross talk louder between two ground return farm lines when only one is on each line than when several are on one or both?—A. K.

Suppose you are talking on one line. The current from your telephone surges from ground up into your line and back again, alternately charging and discharging many times a second. This induces charges in the other line which is parallel, and these charges seek the path to earth. If there is only one receiver off the hook, practically all the charges must go through it. The impedance of the bells is very high, so that they allow very little talking current to pass through them. But if there are several receivers off the hook, the total charge will be divided more or less between them, so that the sound in each is not as loud as if it had been the only one in the circuit.

Editor SOUND WAVES: In preparing to cut over from magneto to a common battery switchboard, we have been installing condensers on all the telephones, cutting them in series with the bell. That is, so that when the receiver is off the hook the condenser is not in circuit. Why would it not be as well to leave the condenser in the line and talk through it? It would save cutting into the circuit inside the instrument. We are also having some trouble with ringing through the condensers, as some of our telephones are quite old and weak. How can we fix it to get along till we cut over? There is more trouble about ringing off than in calling central.—J. K.

If the condenser is wired into the line so that you talk through it, you will get along all right till you have cut over to the new switchboard. For a while each magneto telephone will be obliged to work on the common battery system. Though the condenser is needed to keep the battery current from the exchange from flowing through the bell, yet when the subscriber is talking we want a flow of current to operate the supervisory signal. Without this the operator could not tell that the subscribers were on the line.

If your hand generators are not too far gone, you may be able to get satisfactory service by putting two condensers in parallel. This will give you four microfarads through which to ring instead of two. If this fails, wire up a common push button around the condenser so as to short circuit it. Normally the button is open, leaving the condenser in service. Give the subscriber instructions to push the button while ringing. This will short circuit the condenser and allow the generator to get in its best work. It is only a makeshift, but it will tide you over till you can install the new system.

Editor SOUND WAVES: What is the meaning of the word "harmonic" as applied to selective ringing systems? I have heard conflicting explanations and would like to know the true meaning.—L. T.

The true meaning of the word "harmonic" as used in ringing party lines is that the mechanical part of the bell is tuned to be in harmony with the frequency which is desired to ring it. This harmonizing is largely a mechanical act, consisting as it does in so adjusting the stiffness of spring and the length and weight of the clapper rod and clapper that the frequency with which the whole will vibrate when given an initial motion will be the same as that of the current intended to ring it. Further, it must not respond to current of a frequency higher or lower than the one intended. The term "harmonic" does not apply to the relation of the different frequencies to each other. Any frequencies may be used, provided they are far enough apart not to influence other bells than those tuned to harmony with a given one. The so-called "harmonic series" refers to the higher frequencies which are found in almost any single note produced by any musical instrument. If the note emitted by an instrument be middle C, its fundamental or main frequency will be about 256 cycles per second. But the sound may contain other frequencies in it, and those others will be either twice, three times, four times, etc., the fundamental frequency, or some of them. It happens that the frequencies in some of the harmonic systems of today

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are in the harmonic ratio, namely, 16 2-3, 22 1-3, 50, and 66 2-3. But this has nothing to do with the harmonic principle of ringing. It arose from the use of dynamo ringing machines which had to be made with an even number of poles. With the shaft running at 1,000 r. p. m. the four machines would have two, four, six and eight poles, respectively. Now that the pole-changer has evolved into something better, any frequencies may be used and still be harmonic.

Editor Sound Waves: Is it possible to work a four-party selective system, ringing with a combination of battery and an ordinary ringing generator? If so, will you show how it is wired? I have heard that it has been done, but do not see how it would work.—M. D. E.

A system similar to the one which you describe has been used under the name of the "Knox-Dickey System." In it the battery was put in series with the ringing generator. The essentials were as shown in Figure 6. The

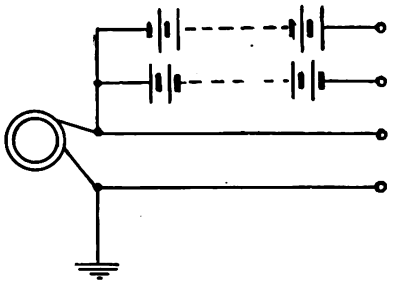

Figure 6.

voltage at any instant which exists from *G* to the terminal marked (—) will be the sum of the voltages of the battery and the generator. The battery voltage is constant, that of the generator varies from instant to instant. When the generator E. M. F. is positive to earth, the total is the sum of the two. When the generator has reversed, it will be the difference of the two. If the battery voltage just equals the maximum voltage of the generator, then

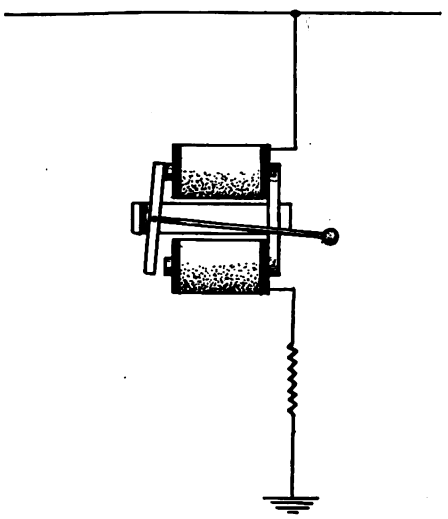

Figure 7.

the total voltage will vary between zero and the sum. In practice, the battery voltage was not as great.

This combination will operate the regular biased bell very nicely, but on the Knox-Dickey system the bells were not biased by springs. Each bell was mounted on edge, as in Figure 7. To limit the flow of current 10,000 ohms resistance was put in series with the bell. From tests made in the telephone laboratory of Purdue University it appears that this resistance can not be much less than 6,000 ohms, that being the least resistance which would give good ringing. The bell depends on gravity to carry the clapper down after having been raised by the current. This makes a rather weak restoring force, so that it can not stand a strong pulsation. When the non-inductive resistance is removed, the clapper goes up with the current and tends to stick there. But the battery combination of Figure 6 will give very good results when used with ordinary biased bells.

The Man in Charge at Houston.

The Independent field recently acquired a new recruit in the person of Mr. S. D. Levings, who has been for the past three years assistant to the construction engineer for the Chicago Telephone Company.

Mr. Levings severed his connections with the Bell concern to accept a position as constructing engineer for the well-known firm of McMeen & Miller. Messrs. McMeen & Miller have recently acquired the contract

S. D. Levings.

for engineering and constructing an automatic system in Houston, Texas, where they have detailed Mr. Levings as engineer in charge.

Mr. Levings will follow the most up-to-date principles in the design of the Houston plant, and the incorporators of the new company are to be congratulated upon having secured the services of McMeen & Miller as their engineers.

Melbourne and Sydney Telephone Line.

Consul-General John P. Bray reports that the two leading cities of Australia, Melbourne and Sydney, are now connected by telephone, the line being officially declared open on July 10. The line is a little over 600 miles in length and is composed of two exceptionally strong and heavy copper wires; the cost of construction was $227,198 and it took four months to complete. The fee for conversations, viz., 6 shillings ($1.46) for three minutes is thought to be too high in business circles, but the postmaster-general, by whose department the line is controlled, has stated that if after three months' trial the line proves payable a series of progressive reductions in the rate will be made.

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The Independent Telephone and the Public

By G. W. Weippiert

BEING neither a prophet, nor the son of a prophet, I am somewhat reluctant about speaking "with authority" about the future of the Independent telephone industry.

Like Topsy, the business has just grown. That we all know. Its genesis, although a thing of yesterday, is lost in obscurity. The original Independent telephone systems were called into life by a just and reasonable hatred of monopoly. But the men who originated them very frequently were not possessed of a technical knowledge of the telephone science, nor did they have an adequate understanding of the financial conditions and limitations of the enterprise.

* * *

Much is being said in the press at this time about the inability of telephone promoters to secure capital for their plants. Everybody is ready to admit that the telephone business is a profitable one; but when it comes to investing money in it the majority of "everybody" is reluctant to demonstrate its faith by putting up hard cash. And for this reluctance the pioneers of the movement—disinterested and patriotic as they were—are largely to blame.

During the past three months I have been devoting most of my time to acquiring an impartial insight into the popular feeling regarding Independent telephone investments, and the results of this investigation caused me to write the foregoing introduction.

The public still has faith in the Independent movement, but it is not enthusiastic about the way things have been managed in many places. I believe, firmly and honestly, that scores of companies must turn over a new leaf before they can enter upon an era of real prosperity, and I believe also that the errors made in the past should be pointed out by the telephone journals so that in the future they may not be repeated.

* * *

Just a few instances of mismanagement which are typical of the local Independent situation in every state. A few years ago the telephone business of a good-sized town in Iowa was controlled by an Independent company. When it began operations, its equipment was superior to that of its competitor. Within a few months its telephones were installed in almost every business house and residence. But instead of keeping up the excellence of its service, the company neglected its patrons and employed all its earnings in making out-of-town extensions, thereby not only alienating the friendship of the subscribers, but also incurring the ill-will of small stockholders who had been promised fair dividends; in place of which they received nothing but a hypothetical increase in the "book value" of their stock. The opposition was not slow to take advantage of the weakness of its Independent competitor. It rebuilt its plant, made fair rates and today has seven instruments where the once dominant Independent company has one.

* * *

You and I know that the Bell Company would never have reduced rates or improved the equipment had it not been for Independent competition, but let us not forget that the public has a short memory and motives. A telephone subscriber wants good service and will buy it where he can get it, irrespective of sentiment. First-class equipment and up-to-date exchange service retain business, and the Independent manager who expects to perpetuate success on purely sentimental grounds will sooner or later make a failure of his plant.

* * *

Now as to local investors. After conversing with over 150 of them, in twenty-five different localities, I find that those who are interested in companies which pay regular dividends, carrying from six to eight per cent, are satisfied with their investments, while those who hold stock in organizations whose officers use all the profits for extensions are dissatisfied and anxious to sell.

When I speak of stockholders in this connection, I refer to men and women who hold no offices in the companies, but who depend upon their investments for a means of support. As this is the class of people from which the capital for larger enterprise must come, I consider their views of more importance than those of speculators and dealers in securities.

* * *

Another instance of mismanagement, which may lead to disagreeable results, came within my observation during the past month. A company operating in a prosperous western town, after enjoying a phenomenally prosperous life of eight or nine years, now has a practically worthless plant and not one cent of money to rebuild its system. The subscribers are up in arms and arranging for a concerted movement to bring about a reform or to invite the Bell Company to establish an exchange. The trouble with this company was that it paid out all its earnings in exorbitant dividends and made no provisions for deterioration. The stockholders who have grown fat on the proceeds of the business decline to put up the money for a modern equipment and the people refuse to pay higher rates for the service.

The plea that it costs more to operate a large exchange than a smaller one, although it may appeal with irresistible force to telephone managers, is not a shibboleth with which to conjure the masses. In the case under discussion the subscribers argue that if a merchant enlarges his business he does not ask his customer to pay more for the goods he sells nor does he demand of them that they put up a new building for him when the old store becomes too cramped for the volume of trade. Indirectly, of course, they pay for such improvements, but to a direct tax they will not submit. The same reasoning the subscribers apply to the telephone situation. For nine years, they say, the stockholders of the company have drawn a big income and now they want us to build a new system for their further pecuniary advantage. Why should we do it? And, just between ourselves, why should they? Had the exchange been a losing proposition, the case would be different, of course. But to ask the people, after a long term of prosperity, to dig down and buy new equipments for an organization every member of which has made money out of it does seem unfair and is not calculated to enhance the repu-

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The people and telephone companies must work together. Wherever they do, the companies are doing well and the stockholders are satisfied. It is not my intention to discuss the financial organization of telephone companies. The day of the grafter has passed and the fiscal crimes of years ago can not be repeated anywhere in this country.

In addressing a club meeting not long ago, I made the assertion that a man who invests his money in a public-serving corporation of any description is entitled to larger returns than he who buys county or municipal bonds, because every public-utility enterprise has in it an element of risk. Not a large element of risk, it is true, but still important enough to entitle him to some extra compensation.

The stock bonus which is usually given to the buyers of the bonds of new companies is therefore not an unmixed evil, but in a way an act of justice, and when a telephone company is organized on a conservative basis and working under a franchise assuring a fair income there can be no reasonable objection to the bonus. I mention this point because in my conversations with visitors it was brought out clearly that most of them favor a bond and stock issue rather than a plain issue of stock.

* * *

Being in no way connected with any financial enterprise, I found it comparatively easy to approach persons of moderate means and get a free expression of their views regarding telephone investments. As already stated, those who are in receipt of regular dividends are favorably impressed with the business and its future, and never hesitate to take up new stock issued for the purpose of extending their own systems. Among this class the companies of larger cities, and the various long distance companies, might find buyers for their securities. On the other hand, small investors who have received nothing but added "book values" appear to be deaf to appeals for further investments.

The country bankers, as a class, do not seem to take kindly to telephone securities, although many of them are carrying limited lots. In my judgment the financial support for Independent enterprises must come from the people directly; at least until a great combination shall have been effected among Independent interests, and that day, I am sure, is in the dim, distant future.

* * *

Much that I wish to say along these lines must be left unsaid just now, but I hope that I have made it quite plain that "sentimental sentiment" must be eliminated from the dealings between telephone companies and telephone security holders and subscribers. Sentiment is all right—the sentiment which unites all good citizens into one common mass to fight monopoly and extortion—but that sickly "sentiment" which would force people to be loyal to a cause just because it is labeled "anti-monopoly," had better be shelved by the Independent telephone men. It has lost its power, except where good service and reasonable earnings accompany the preachment of its advocates.

It behooves the pilots of the Independent ship to steer nicely between the Scylla of inefficient service and the Charybdis of nondividend paying stock. These two danger points avoided, the sailing will be clear and money for new enterprises will be forthcoming, even in seasons of stringency.

* * *

Hard times need have no terrors for the telephone investor, because the telephone is a necessity which will be used quite as freely in days of adversity as it is in this era of prosperity. The railroads may suffer from a period of depression, and so may other public service utilities which are more or less of a luxury. But hard times or good times, people must communicate with each other, and if money is scarce they will use the telephone instead of the railway train.

The telegraph strike has done much for the long distance telephone. Hundreds of business men have been converted to the use of the telephone by it, and many of those I have talked with admitted that the long distance telephone is a better servant than the telegraph. More than that. They learned that the telephone is the cheapest method of communication, and several wholesale houses in Iowa are now doing much of their country business by telephone. At eight o'clock Monday morning the storekeepers in the adjoining small towns are called up and asked to send in their orders. The plan has worked so successfully that one firm was able to dispense with the services of a local traveling salesman.

This instance goes to show that the possibilities of the telephone are beyond calculation. Every incident in the business life of the nation develops new uses. And so it will go on forever. Telephone men themselves are unable to predict what will be the ultimate development of their industry.

* * *

But the public at large knows practically nothing about telephone systems and their remarkable earning capacity at all times of the year and in any circumstances. Neither has it the least idea of the permanent value of a telephone plant and the various articles and materials entering into its construction. It seems to me that if telephone security salesmen would lay more stress upon the actual physical value back of their securities than upon their possible earnings they could interest hundreds of investors who prefer facts to estimates.

Any business that has back of it the patronage of the entire population of a community, state or nation, and back of its securities a really valuable plant, can ask for the financial support of capitalists, large and small, without resorting to ambiguity or deception. The Independent telephone industry is such a business, and its future is assured, in my opinion, just as long as the men in control of it—nationally or locally—conduct its affairs in accordance with reason and judgment.

* * *

Necessarily, my observations have been jotted down in a fragmentary sort of way. Yet I trust they contain an occasional thought that may prove helpful. They may not be approved in toto. I would not myself have approved of them a short time ago. But they are the voice of the people, and in a public utility business the voice of the people is the dominant note from which no one engaged in it can get away.

THE evening class in telephony at the Armour Institute of Technology is proving of more than ordinary interest, having an unusually large enrollment. Upon inquiry as to the limit of accommodations for evening work, Dean Raymond assured us that more instructors would be added as the class grew. The boys are meeting Tuesday and Friday evenings of each week.

A REVISED constitution of the International Independent Telephone Association is being distributed. It

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The Law and the Telephone

By George H. Murdoch, Jr.

What Constitutes Unfair Competition.—In an action by the Rocky Mountain Bell Telephone Company against the Utah Independent Telephone Company, in the allegations contained in the complaint in condensed form are, in substance, as follows:

That the plaintiff (hereafter designated appellant) is a corporation, and for many years last past has been established in, and conducting a public telephone business in Salt Lake City, Utah, with about 6,000 subscribers using its telephone and exchange system. That during all of said years appellant had established and maintained for its own, and for the convenience of its patrons, certain departments, one of which is known and designated as "trouble department," and the telephone number for said department is 888. That said trouble department, with said number, was established and was used, and is used, for the purpose of making it possible and convenient for the patrons of appellant to notify it of any trouble or imperfections that may arise or occur in operating the telephones used by such patrons, with a view of having the same put in order when they become defective or out of order. That the number 888, connecting said department as aforesaid, became well known to its patrons, all of whom were accustomed to call said number whenever their telephone failed to work properly. That defendant company (hereafter called respondent) some years after appellant had established its telephone system, also established a public telephone system and exchange in Salt Lake City, with subscribing patrons using the same. That respondent, well knowing the long and extensive use by appellant of its telephone having the number 888, as being the telephone number connecting its trouble department, with the intent to interfere with and of appropriating appellant's business, and of injuring said business, and with the intent to deceive appellant's patrons and the public, adopted the name "trouble clerk" for the same department of its business, and also adopted the number 888 for the number of the telephone used in connecting its trouble department and designated as trouble clerk. That the name "trouble department" designated by said number 888, and the telephone connecting the same with the telephones used by its patrons, were published by appellant in its directory used by its patrons covering its telephone system, for their own and for public use. That therefore, and by the means aforesaid, the respondent acquires, and will continue to acquire, knowledge of applications made to appellant to correct defects in its telephones, and, in consequence of such information, unintentionally communicated by parties and so fraudulently secured by respondent, the respondent proceeds to send solicitors, and uses other means by which it fraudulently and surreptitiously secures the said patrons to subscribe to respondent's telephones, contrary to their wishes and intentions, when seeking to communicate with appellant. That patrons of appellant make mistakes by calling respondent's number 888, instead of appellant's number 888, and thereby annoyance and great, lasting and irreparable damage ensues to appellant. That the instruments and telephones in use by both appellant and respondent are so much alike in appearance that the public is liable to be and are deceived, and are unable, without special inspection, to distinguish said instruments, so used by both parties. That the respondent threatens to, and will, unless restrained, continue to use the said number 888 for the purposes alleged, and will wrongfully continue to divert appellant's business, as stated, and will fraudulently and surreptitiously continue to unlawfully inquire into and obtain information of, and interfere with, appellant's said business with its patrons, to appellant's great and irreparable damage.

On the trial there was a judgment in favor of the defendant company, which has recently been affirmed by the Supreme Court of Utah, in an opinion in part as follows:

"The gravamen of the complaint, as we view it, consists in the adoption by respondent of the numerals 888, or in the adoption rather of that number for its telephone connecting its trouble department designated as "trouble clerk," with the telephones used by its subscribers and patrons after the appellant had for years prior thereto adopted and used that number for the same purpose. It is quite true that the appellant alleges that the adoption of the number, by respondent, was and is fraudulent, surreptitious, and done for the purpose of obtaining knowledge and information, and then using the same to induce the patrons of appellant to subscribe for and use the telephones of the respondent, instead of those of the appellant to its injury and damage. There is no direct allegation that the respondent made the numbers in imitation of those used by appellant, or that there is any deceit or misrepresentation practiced in their use, except for the purpose aforesaid. The use and the manner thereof being clearly stated, the mere allegations of fraudulent and surreptitious conduct, as alleged, must, of course, be considered in the light of all the other facts alleged. We take it, these allegations, when made in connection with, or of characterizing some legal right, are not alone sufficient, in all cases, to authorize relief, where it otherwise appears that these terms are used only to give color to statements which, without them, would be entirely insufficient. In other words, if the respondent had a legal right to adopt and use the numerals 888 in connection with its telephone, connecting its so-called 'Trouble Department,' with the telephones used by its patrons, then the allegations above referred to are of little, if any, legal significance. In this connection, it is of some importance that the appellant does not claim that the respondent had not a perfect legal, as well as moral right, to establish a telephone system, to organize it into departments suitable to its needs, and to designate such departments by any name it saw fit. Neither is it claimed that respondent had not the right to connect with the telephone used by its patrons and the public, and to use any numerals or numbers it saw fit for that purpose, except, it is claimed, that it had not the right to use the number 888 in connecting its 'Trouble Clerk' for the same purpose that appellant used that number. Indeed, there is no claim, and none such would be tenable if made, that respondent did not have the right to use the figure 8 in any form or combination, except in the combination as the same was adopted and used by appellant, to wit, the combination '888,' and then only when used in connection with that particular department. Is the distinction legally sustainable? We are not unmindful of the allegations of surreptition and fraud, nor of those which allege a benefit to a respondent and a detriment and annoyance to appellant, arising out of the use made by respondent of the number 888. Of course, if the respondent had a legal right to adopt and use that

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number in connection with its 'Trouble Clerk,' then the motive it had in view in so doing is wholly immaterial from a legal standpoint. Nor would incidental injury or annoyance from that source be of any legal significance, if they were the resultant of a legal right.

"Nor would the fact that some of appellant's patrons subscribed for and used respondent's telephones in consequence of the use of the number 888, as alleged, give the appellant a right to an injunction unless, perhaps, the subscribers were obtained by a method of what in law is termed unfair competition or unfair trade. Unfair competition, as we understand it, consists in one person imitating, by some device or designation, the wares made and sold by another, for the purpose of palming off or substituting his wares for those of the other, and in that way misleading the purchaser by inducing him to buy the wares made and sold by the first instead of those by the second. This, in law, constitutes misrepresentation and deception, and therefore becomes, and is, a fraud, not only against the person whose wares are thus imitated, but against the public as well. There is nothing of this sort in this case. Appellant is not dealing in any article which is being imitated, either in substance or form, by the use of the mystic number 888. It is true that its Trouble Department, or the telephone number that connects that department with all other telephones, is identified by that number. But this is not for the purpose of either increasing its use, or augmenting the sale, or to identify any article of trade or commerce made or sold, but for the sole purpose of making it possible and convenient for the patrons of appellant to communicate with that department. No one is injured, no one is deceived, except as alleged, because respondent is using the same number in having its patrons communicate with its department organized for the same purpose. It is contended, however, that the public are deceived for the reason that the telephones of the contending parties are so similar in construction and appearance that the telephones used by appellant are sometimes mistaken for those of the respondent, and that, when this occurs, a patron may, and at times does, call up the respondent's department when he in fact intends to call up appellant's department, and in that way respondent is apprised of the persons using the telephones of appellant and that there is trouble with those particular telephones; that, upon learning of this fact, it induces appellant's subscribers to abandon the use of its telephones, and subscribe for and use those of the respondent. It is apparent that, when a mistake of this kind occurs, it arises entirely through the carelessness or error of one of appellant's patrons, and not by any direct fraud or misrepresentation made by respondent. The respondent, as we think, lawfully organized its system, and truthfully designated, and now designates, its several departments by certain names, and has connected them with telephones, giving them certain numbers for its own, as well as its patrons' convenience. This is just what appellant did, and continues to do. Moreover, it is manifest that respondent need not have recourse to the trouble department of appellant to ascertain who are its patrons. These, it is alleged, are made known to all, by means of a published directory published by appellant, wherein the names of the patrons and the number of their telephones are given.

"All that the respondent can learn, therefore, is whose telephone is defective, and this can only be so when one of the patrons of appellant makes a mistake by carelessly using the telephone of respondent instead of that of appellant. Is respondent to be enjoined from conducting its business in its own way simply because it has so organized it that careless people may use its telephones for a certain purpose, not for pay, instead of those of appellant, who is a competitor or respondent in the same business? Is it not likewise apparent that the public, generally—that is, such as are using telephones, and are not subscribers to appellant's system—cannot be affected in this way. Neither can those who are subscribers or users of either systems alone be mistaken, unless they use the telephone of some other subscriber. Is respondent to be held legally responsible for occurrences of this character? Surely it cannot seriously be contended that respondent organized its system and is conducting it in that way for the sole purpose of benefiting itself from chance occurrences, such as those above mentioned. But suppose it is true that respondent does learn of trouble in respect to appellant's telephones by the means alleged. It could not profit from this unless it can convince the subscriber, using appellant's telephone, that respondent's system is the better one, and is better calculated to serve his purpose, in that it is less liable to cause trouble. This, if competition is permissible in the telephone business, would seem to be legitimate competition. Up to this point, therefore, respondent does not seem to have practiced any deceit, nor fraud, nor misrepresentation, but has simply openly announced to all that its trouble department is connected with telephone 888, which is the same number used by appellant for the same purpose. If misrepresentation occurs, it must be apart from what we have so far met with. It must be in fraudulently inducing the patrons of appellant to abandon its telephones and use those of respondent instead. To do so without practicing fraud or deceit, certainly is legal and proper, and is not frowned upon by law, but rather encouraged as beneficial to the public. The change of patrons is accomplished by the methods described in the complaint, and these methods, as we have attempted to show, are not illegal. While it may be that respondent does not, in all things, conform to the Golden Rule in conducting its business, we are not convinced that it violates any legal or equitable rules. In such event an appeal should be made to the moral rather than the legal code. Modern business seems not to be conducted strictly in accordance with the moral code, and if we assumed the authority to issue an injunction every time we thought this code was being violated, it would not be long before there would be no business transacted, except court business, and that would continue, not so much for the reason that it conformed to the code, as it would as a means to direct, regulate and control all business affairs.

"There is no claim in this case that the number 888, either alone, or as used in connection with the telephone connected with appellant's trouble department, is, or constitutes, a trade-mark. Nor could this claim prevail, if made, as is well illustrated by the authorities cited. Nor is it what is known in law as a trade-name, although in some respects it may resemble such. In this case, however, both parties have organized their telephone systems into departments, which departments, for convenience, are known by certain names, and are, as is necessary for them to be, connected by means of telephones, having certain numbers arbitrarily chosen from the Arabic numerals. Both parties have a natural and legal right to name their departments as they please, and likewise to select such numbers for the telephones connecting the several departments with their entire system as they may choose. Is it an invasion of the other's legal rights when one applies the same number to its telephone that is used by the other for the same department? Is this an infringement of a trade-mark, or an interference with

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an established trade-name? We do not think it is, or can be, either. The telephone business is peculiar in that each telephone is designated by a number. These numbers are used, we assume, because the numerals admit of almost infinite combinations, and these make it possible to give each telephone a distinct number. If appellant may prevent the use of one number in connection with a certain telephone, upon the ground of prior use and inconvenience, why not of all used by respondent when inconvenience results? Of course, inconvenience may result, and no doubt does, when the same number is used by the second user for a similar department, which is in use by the first. But inconvenience may also arise where patrons of each system have the same number, and yet it is not practicable to prevent a duplication of these numbers. The mere fact that such could be avoided when applied to the several departments of the parties to this action, we think, does not give the legal right to prevent their use by either one or the other. Further, we may take judicial notice of that which is universally known, namely, that the patronage of a telephone system differs greatly from that of selling and buying articles of manufacture and commerce. The individual telephones are leased or rented at fixed rates and usually for some definite time. One who intends becoming a subscriber to, or user of, either one or the other telephone systems in use, will not easily be deceived by the simple fact that the two trouble departments of the different systems, are connected by a telephone having the same number. This is not like an article of commerce, labeled in imitation of another, nor in assuming a name, or the number of a well known and established business, for the purpose of misleading either actual or prospective buyers.—88 P. 26.

Interior Automatic Telephone Apparatus

By Elmer R. Corwin

THE success of modern telephony is in simplification of apparatus, making the working parts entirely automatic and reducing cost of installation and maintenance to a minimum.

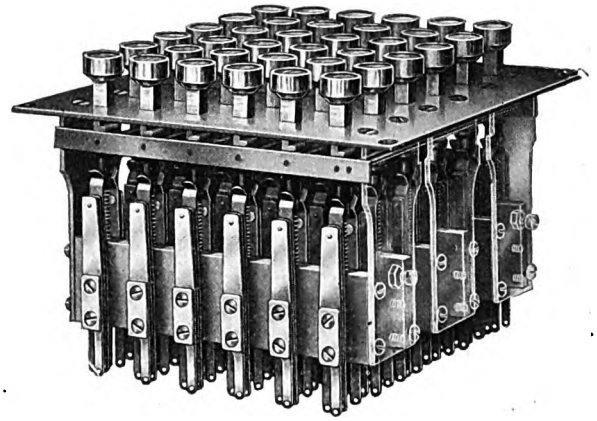
There is probably no other branch of the telephone business which has received so much careful study as the interior telephone system.

The importance of having a telephone for carrying on a business, or talking from a residence to outside parties is fully realized as being a necessity. But how many people realize the importance of having an interior telephone system for their own private use, besides being able to use any telephone in the system to communicate with parties on the outside. Consider the number of residences, offices, schools, hospitals, hotels, mills and factories in every city or town using one or perhaps two telephones which connect through a central office to all others in the town, the same being furnished, installed and maintained by an operating company on a rental basis. Here the operating company solicits the business of the people and convinces them that the telephone is a necessity and the company then builds their lines from the exchange to all parts of the city with skilled labor and installs the highest grade telephone apparatus which they can procure. The exchange is run by experienced telephone help and when a telephone or its line is out of order it is quickly put in shape by this experienced help. In this manner the subscriber gets the very best telephone service to outside parties without any expense except the rental.

Consider that many of these places have had to be solicited and convinced that the exchange telephone is a necessity, but after once having them in use they will not do without them. Think of the many places where an interior system can be used to just as good advantage from room to room, or from one department to another, if the parties were only solicited and convinced as in the case of the exchange telephone. The operating company have their experienced solicitors and employes who can install the intercommunicating system and they can maintain this system at a very little expense after the installation is completed. Supposing a ten-station intercommunicating system were installed on a rental basis of $1 per month for each telephone, arranging the system so that any party in the intercommunicating system could call central over a trunk line for which a rental of $5 per month is paid. An answering or attendant's station is installed for receiving the incoming calls on the trunk line and distributing to the proper party or department. This will mean a rental of $15 per month for the ten stations and one trunk line.

Instead of having to hold your city line for five or ten minutes when a call comes in to a place of business, or until some one can run up or down stairs and call the party wanted, the call is transferred in the intercommunicating system to the proper party in imperceptible time.

A great advantage is obtained in an intercommunicating system in being able to call and converse directly



from any telephone to any other one in the system, thus dispensing with the services of an operator who must be in attendance at the switchboard at all times. In many places the business requires the use of the telephone after regular working hours or on Sundays and holidays, when an intercommunicating system is a great saving and convenience, for it is always ready for use, as each party is their own operator. There is no expense attached to these systems except when they are being used and then it is very slight compared to any other kind of system on the market.

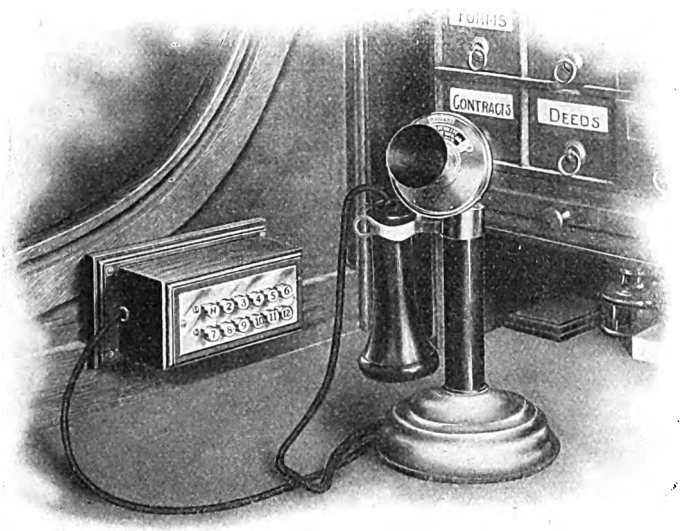
There are two different kinds of telephone circuit equipments used in intercommunicating work.

First—The local battery, or magneto telephone

equipment, using a battery of about three volts pressure at each telephone and an induction coil with a ratio of about one to eight for stepping up the current to a pressure which will pass through the resistance of the line circuit. Hand generators are commonly used for furnishing the energy for ringing the bells at the various stations.

Second—The one most commonly used is the common battery equipment. The essential features of the telephone equipment for common battery work is the transmitter and receiver. The signaling apparatus is either a direct or alternating current bell or ringer. The hook switch for changing the circuit connections from the signaling to the talking and receiving positions and vice versa.

The system bearing my name has been designed to meet a strong and constantly increasing demand for high-grade intercommunicating apparatus at a reasonable price. The system does away with jacks, plugs and cords and replaces them with a single button for each line at each telephone. In this manner it simplifies the circuit connections, avoids the breaking of cords, short circuiting of plugs and poor connections between plugs



and jacks. Above all, it saves the telephone user time and confusion, as the one button is used for ringing as well as talking purposes. Another feature of great importance is a combined ringing and talking key, which is very substantially made so as to stand the continual wear and rough handling to which such parts are usually subjected.

The electrical contacts are claimed to be absolutely reliable and the springs just heavy enough to retain their elasticity and yet not impede the action. The plungers also are so arranged that they will not stick when released. The mountings are of ample size and of material which will not corrode or rust.

The accompanying illustration shows a group of buttons assembled complete, and particular attention is invited to the simplicity of construction.

The plungers are made from square brass stock to prevent them from turning in the top mounting plate. The lower portion of the plunger is turned to a suitable size to allow a hard rubber bushing, having a hole in the center, to be forced over it from the lower end and up to the center.

This rubber bushing rests against the German silver master contact springs and forces them into engagement with the talking and ringing contacts when the button is pressed. A removable paper number, covered with transparent celluloid, is held on to the top of the plunger by means of a metal ring. The top and end mounting plates are accurately stamped with steel dies, so that all parts are interchangeable. Guide slots are punched in the end mounting plates which support the mechanism for tripping and locking the buttons when in action. Brass mounting bars are used for supporting the contact springs and these bars are drilled so as to hold the lower end of the plunger in alignment. A spiral steel compression spring is used for restoring the button when released.

Bessemer coppered steel rods are used for tripping the buttons, these rods being riveted to the guide bars, which rest in the slots of the end mounting frame. A heavy adjustment spring is fastened to the end of one of the mounting plates and rests against the tripping device, having an adjustment screw engaging it in such a manner that any adjustment may be had. This allows the key to be placed in any position and yet all buttons will lock and unlock in the most satisfactory manner. Standard sizes of keys are carried in stock as follows: Six, twelve, eighteen, twenty-four and thirty-six. Other sizes will be made to order, if required.

Generally speaking, there are three classes of intercommunicating service, as follows:

First—All telephones intercommunicating. This service is so arranged that any one telephone can call and converse with another and not be interfered with by any other parties who may be talking over another pair of wires at the same time.

Second—Limited service. In this class only a certain number of instruments can call each other, the other being able to call only those departments with which they have occasion to transact business.

Third—Party line service. In this class all instruments are connected to one line and all bells ring at the same time, a code signal being used for each different station.

Herewith are shown illustrations of a desk and wall type, automatic, push button system, equipped for common battery metallic circuits, which is recommended as a practical system to employ where regular intercommunicating service is desired. These telephones are for use in connection with exchanges having full common battery equipment. Any party wishing to call another in the intercommunicating system presses the button corresponding to the number of his line as far down as possible, which rings the bell at that station. Removing the fingers from the button restores it to a talking position, and removing the receiver from the hook switch connects the telephone to the selective line for talking. The party called answers by pressing the home button (marked H) into a locking position and removing the receiver from the hook switch which connects the telephone to the called, or home line, for conversation. Any button, being pressed to a locking position, unlocks another button which previously had been locked down, and thus prevents other telephones than the one desired from being connected for talking. This will be appreciated when it is understood that no locking or unlocking mechanism is required in connection with a desk telephone, and at the most four conductors, and in some cases but two conductors, are used from the desk stand to the key box located on or near the desk.

Where it is desired to use exchange connections to and from the intercommunicating system, it is so arranged that any of the telephones may call central by pressing the trunk button (marked C) into a locking position, and removing the receiver from the hook switch

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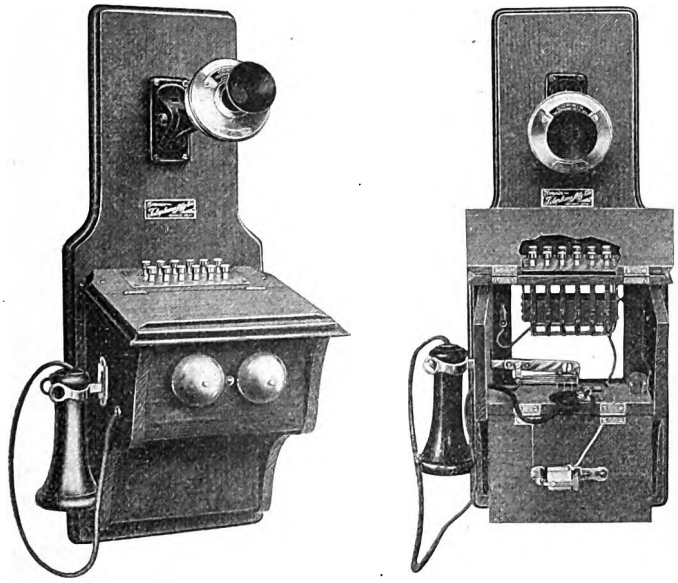
when the telephone is connected for talking. An answering station is used for the purpose of receiving incoming calls and transferring them to the proper party. The attendant at the answering station, upon receiving a call from the exchange, pressing the trunk button into a locking position, removes the receiver from the hook switch and answers. A party in some other department being wanted, the attendant presses the trunk button clear down, which connects a high-wound locking relay across the trunk line and holds the disconnect signal so that the operator will not disconnect the trunk line while the attendant is calling the party to answer. While pressing the button down, the attendant hangs the receiver upon the hook switch, which disconnects the telephone from the line, then calls the party and requests them to answer on the trunk line.

The intercommunicating party wanted on the trunk line answers by pressing the trunk button and removing the receiver from the hook switch, and the telephone, being low resistance compared to the high-wound locking relay, will allow the mechanism of the relay to release, leaving a clear trunk line to talk over. As soon as the party hangs the receiver upon the hook switch the line is clear, the operator gets the disconnect and takes down the connection. This arrangement does not require any



hold signal plug key, jack or coil, and no calling back to the attendant to take down the hold signal device, but leaves the trunk line free as soon as the parties have finished talking.

The buttons for the trunk connections are the same as the ones for intercommunicating purposes, so that any one not in use may be connected for trunking and the only apparatus needed to make any telephone an answering station is a high-wound locking relay for the disconnect hold signal and an ordinary extension bell.

The system effects a saving in the amount of apparatus and wiring necessary for the best operation, and eliminates losses of the talking circuit. A standard long distance transmitter is used on all telephones, being especially designed for common battery circuits, and this, in combination with a receiver and impedance coil, give the best transmission that it is possible to obtain for both local and long distance lines.

The hook switches used in the instruments are of special design and all parts are either punchings or made

The simplicity of the circuits and apparatus of the telephone allows the use of cabinets, both useful and ornamental, being carefully built so as to hold their shape indefinitely.

The wall type cabinet herein illustrated has all the advantages of the common battery type cabinets in use and has the intercommunicating advantages as well. The keys being mounted on the writing shelf in such a manner as to be readily accessible for the wiring and yet leaving ample room for the shelf to be used for its writing purpose. A suitable opening is made in the back board of the cabinet for the cable which connects to the key.

Spring hinges are used for carrying the telephone circuits to the hinged portion of the cabinets and all of the exposed metal parts of the telephones are insulated from the circuits so as to prevent accidental shocks while using the telephone.

The front portion of the cabinet, containing the bells, is arranged to unlock and swing down on hinges, thereby fully exposing all of the working parts of the key and hook switch. The receiver cord enters the cabinet through a bushed hole located so as to prevent the entangling of the cord in the hook or key.

Suitable terminals are provided at all points of the circuit on which the various wires which might require testing are terminated.

Dean's Advertising Manager.

Fred A. Cornell, advertising manager for The Dean Electric Company, Elyria, Ohio, gained his telephone experience with The Columbus (Ohio) Citizens' Telephone Company and with The Western Electric Company of New York.

While with the latter concern he edited a small monthly sheet styled *The Bulletin,* which was distributed

F. A. Cornell.

at the company's expense for the confidential information of the employes only. This work, together with a general newspaper experience along with his college course at Ohio State University, fits him for publicity work and should enable him to maintain the high standard of adver-

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Telephones in Use in Other Lands.

The telephone business in Germany is under the control of three separate administrations—the Reichs-Postant, Berlin, being the controlling power for all of Germany, with the exception of Wurtemberg and Bavaria, where separate administrations control the telephone service. Until recently magneto switchboards and subscribers' apparatus have been in use in Germany. Within the last three or four years common battery switchboards and common battery instruments have been introduced. Berlin is about to be transformed into a central battery system.

There is in Berlin one automatic switchboard of the Strowger type, to which are connected about 90 to 100 subscribers. At the town of Hildesheim, in Germany, an automatic exchange for about 2,000 subscribers will shortly be opened. In Bavaria subscribers' sets and switching apparatus are of the generator call type with the exception of the towns of Ludwigshafen, Nuremberg, Furth, Wurzburg and Neustadt, where common battery service is given. In Wurtemberg all exchanges are still of the magneto type, some of them being with automatic clearing out, but not with transmitter battery supplied from the exchange.

The make of apparatus used in Prussia is the government type, developed in its own workshop, and is manufactured by twelve different manufacturers in Berlin. In Wurtemberg the magneto subscribers' sets are manufactured in the government workshop, whereas receivers and transmitters of a standard type are bought in the open market.

In Bavaria the apparatus in use is of a government standard type and is made by manufacturers in Bavaria. Manufacturers from other parts of Germany have not been able to do any business there. At the end of 1905 about 500,000 subscribers' stations were in use in the telephone service of the Reichs-Postant.

The number of telephones purchased annually amount in North Germany to about 50,000, in Wurtemberg to about 3,200, and in Bavaria to about 10,000. The service in the larger cities having individual exchanges on the common battery system is fairly satisfactory, and probably as satisfactory as it is in the larger cities of the United States.

Berlin is at present undergoing a transformation, on the completion of which it is expected to give service which will be up to that given in New York. In Hamburg a large new exchange is being built, which will give fairly efficient service at an immense cost, however. The service in Munich is very good, probably up to any given in the United States. In Stuttgart, in Wurtemberg, the service is not up to what would be given in a city in the United States, the city having a single exchange.

Consul J. I. Brittain, of Kehl, states that the telephone instruments used there are manufactured by the government at Berlin. In the Grand Duchy of Baden and Alsace-Lorraine it is stated that there are about 5,000 telephones in use, and about 200 new instruments are supplied each year. The rent for the telephones is collected by the postoffice officials quarterly in advance.

Consul Thomas H. Norton, of Chemnitz, reports that the telephone service, with 4,952 receivers in the city of Chemnitz, is the property of the city. Sixty-three neighboring towns are in close telephonic communication with Chemnitz, which employs an additional number of nearly 5,000 telephones.

Consul W. L. Lowrie, of Weimar, sends a report stating that $238,000 is about to be spent in that German state for the improvement of the telephone service. Double wires will be strung and connections made with government on account of the increase in the use of the long distance lines. There are now 2,855 telephones in use in the duchy.

Consul General B. H. Ridgely reports from Barcelona that there are only three telephone companies of any importance in Spain.

The apparatus mostly used comes from Paris and Stockholm, and is of the magneto type. The Barcelona company has in use 3,053 telephones, at an average rental of $55 each per annum. They also operate a subsidiary company, reaching, with 2,823 telephones to other cities, while a third company, a branch of the Barcelona company, operates 2,440 telephones, with Madrid for a center. All told these associated companies purchase about 525 telephones a year. They are energetic and growing, and will probably in the near future take active steps to develop the long distance system, which up to date has been very little developed.

Consul D. I. Murphy reports that there are 3,430 telephones in use at Bordeaux, and in the entire department of the Gironde there are 4,356.

Consul Charles B. Harris, of Nagasaki, Japan, reports that the Japanese telephone service is owned by the government and is under the control of the department of communication at Tokio, where the instruments are also manufactured. There are 862 telephones now in use at Nagasaki.

Consul D. W. Williams writes from Cardiff that the National Telephone Company of that district purchases about 1,000 receivers a year. Rural telephone systems such as are used in America are not known in Wales, only the well-to-do having telephones in their houses.

Progress in the South.

EDITOR SOUND WAVES: It is a noteworthy fact that rapid progress and success has been achieved by Independents in the states of Florida and Alabama. The Chipley and Graceville systems in Florida are owned by Thomas Watts, who has more than 300 miles of toll lines equipped with best obtainable apparatus. Chipley has a population of 1,800 with an installation of 268 local instruments and 70 long distance.

The Geneva, Alabama, system is owned by E. M. Tilton, which has only recently been rebuilt. At this place there is a local installation of 160 instruments and 50 long distance telephones. Mr. Tilton also owns the system at Samson, which was burned May 1, completely destroying the local exchange. He is now building metallic long distance lines to reach Hartford.

The Lanier Telephone Company owns the systems at Hartford and Slocum, Alabama. In these systems are 275 local instruments, 55 long distance instruments and 120 miles of toll lines.

The Eenterprise, Alabama, system is owned by Welden Thompson. With 85 miles of toll lines, 175 local and 9 long distance telephones, it is in fine shape to care for its patrons.

At Ozark, W. A. Hill owns a system of 200 local telephones and 20 toll stations and 60 miles of toll lines.

The Florala system is owned by Messrs. Bigbee & Vaughn with 140 local instruments, 16 toll stations and 140 miles of toll lines. An extension of toll lines, some 35 miles, is now building to connect Opp and Laurel Hill.

All of these systems are practically in their infancy, and the interest shown by the owners is encouraging to Independent telephony. The marked success is attributed to the substantial toll lines that knit all of the properties together on the basis of exchange service. Ground lines in this section are a thing of the past. Up-to-date

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Value of the Independent Telephone Security as an Investment

By J. C. Kelsey

ONLY a little while ago a prominent dealer in public utility securities, who studies every detail and who is conservative and safe, gave me his opinion of securities from the standpoint of their market values, stability and certainty of dividends.

First in his list he placed water; second he placed the telephone; third, electric railways, and fourth, electric lighting.

His opinion merits our serious attention. I naturally wondered upon what basis he made his deductions, but did not ask him for his reasons. After some study on the subject, the conclusions of my friend seem to be most logical.

We will all agree that water securities are good. The habit of using water is not a fad; it is a real habit. No one can see why any water property should fall into disuse, or be affected by hard times, or in any manner be influenced by evil or contrary conditions. It will always be a necessity with which to sprinkle the streets; to quench conflagrations and to furnish the basis of steam for our numerous factories and plants. No substitute for water has ever been found, or is apt to be discovered. We must have it to drink; it is essential for cleaning, and Bridget could not prepare our meals without it.

Electric railway properties are good, too. They have fine roadways, strong bridges, good power houses, and enduring rights of way. Their whole being seems to partake of permanency and strength. Ease in transportation is the greatest factor in our safety as a nation. Troops can be mobilized rapidly, and the foe cannot penetrate our interior.

Electric lighting securities are also good. The large city systems are certainly making money. Civilization and light go hand in hand. None of us anticipate or desire a return to darkness. We all know how futile it is to get something for nothing, and thus we may be sure that the great boilers and rotary engines will always have to work to make light. We have, therefore, the assurance of durability.

But telephone securities are especially good, and I propose to demonstrate the fact. We are practically convinced that the telephone is a substantial institution. Of all the methods of transmission of intelligence, the telephone stands first in convenience and usefulness. Nothing can be more satisfactory than talking direct to your customer or your family, far or near. Will anything supplant that? Your imagination fails to reveal a substitute.

A delicate law of nature has been harnessed, as it were, and serves the public in a manner that brings it close to their hearts.

I never so much appreciated the beauty of the telephone as when I saw the homes of the Dakotas, lying two miles or more apart, sometimes buried deep in snow for several weeks, and surrounded by howling blizzards. Imagine how welcome must be the signal of the telephone bell, and the sound of the neighbor's voice in the telephone receiver!

Here is a telephone subscriber who is learning that this same neighbor's voice is cheering his hardworking wife, and is tending to close the gates of the insane asylum to her. You all know that endless work and solitude deadens the mind. Solitude and insanity are closely allied.

Do you think that this element of our industrial citizenship will quit the use of the telephone? I do not think they will.

We know how the farmer quickly gets the physician for his sick child; the veterinary for his ailing stock; the repair man for his threshing machine; the grain dealer for the best price of cereals, and then we realize that the farmer will not dispense with the telephone.

It is said that the women subscribers arrange their hair before they answer the telephone. Surely, this is proof that the telephone has a share in human affections. The telephone is a personal, animate thing, and has become a fixed part of our lives. It will be the last convenience to go should hard times grasp the land.

The small town and the large city face these same conditions on a larger scale. The towns furnish the basis of long distance business, and the large cities make a demand for leased wires. There is no reason why any of these conditions will change. More probably, even newer methods of using the instrument will enlarge the operators' field to supply service.

Telephone companies are remarkably free from damage suits. Electric railways are not so fortunate. Only the other day, an electric railway in Illinois killed fourteen people and frightfully maimed seventy-five more. Following this dreadful calamity, we beheld the spectacle of a United States Judge and a United States Senator,—both said to be directors,—standing by and watching this road thrown into a receiver's hands for an alleged debt of $5,000, in order that they might not be liable for the thousands of dollars' damages. In a single moment the stockholder in this property lost his all. Do you know of a single telephone company in such a predicament? Not one.

In the handling of freight and express, goods are frequently stolen, damaged or lost. These items cost the transportation company much money. The employment of regular watchmen and special detectives alone is a great item of expense, obviated entirely in telephone work because the exchange is never left alone from its inception to the end of time.

Telegraph companies have many troubles, and are continually in the hands of the courts. The telephone company assumes no similar responsibilities. It simply makes a reasonable effort to connect the proper parties for conversation.

Telephone companies do a cash business. The absence of large individual accounts enable the management to see at a glance the true condition of the company in question. There is no chance of any single failure precipitating a like condition in the telephone company.

Telephone companies make use of staple materials, such as copper, lead, iron and hardwood. This has a very decided bearing upon depreciation.

A railroad company has one item of ties, which possibly may be compared to poles. However, as poles are a hundred feet apart and ties two feet or less, and the

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decay ten times as rapid with the ties, the telephone company can hardly be said to be at a disadvantage.

The question of depreciation funds in connection with a telephone plant is distinctly different and unique. Railroads can invest their reserves in tie properties, in coal lands, or in some industry which will give them direct results. The telephone company is by nature compelled to keep its cash renewal reserve in bank, at a low rate of interest. However, being cash, it has the decided advantage of immediate usage. It costs something to borrow money on tie property or coal deposits.

The question of the amount of money to be set aside for depreciation is not difficult. Our Bell friends, or enemies,—as you please,—have always deplored the lack of it in Independent telephone companies. So far, I have been unable to find a single Bell company that comes anywhere near the renewal reserve charge of the Keystone Telephone Company, which is $4.00 per station.

Not only does this property maintain a cash reserve, but, like all Independent telephone companies, it does not have to pay a parent company 4½ per cent of its gross earnings as a royalty tax.

This absurd condition of paying the parent Bell Company 4½ per cent holds through all Bell licensee companies, and is merely a device for fleecing its dwindling number of minority stockholders. The payment of this percentage of gross earnings cannot be justified on any grounds known to man.

I think a great deal of the Bell's trouble, for example, its huge floating debts, come from imbecilic advice given by alleged experts. What good can come from a Bell expert, reared in Boston, and occasionally visiting that mecca of all Bell engineers,—the New York Telephone Company, when he advises the Missouri, Nebraska, California and other licensee officials how to act.

No monopoly employe can be truly expert. He is biased, and is ignorant of real conditions. Not facing active competition, he has about as true a grasp of the real situation as the new babe has of the world. Independent telephone companies have employes not only more efficient, but more loyal. I think, as a rule, Bell employes waste more material than they use, out of pure hatred of the system. The Independent employe has a spirit of helpfulness and as a result lines are built at a lower cost, and exchanges are operated more efficiently and economically.

All in all, Independent telephone securities should not be second in any list. They should rank with the very first. The commodity dealt with is of a permanent nature. It is clearly understood. It has no terrors and will not run amuck.

The cost of operation and maintenance of telephone systems is reasonable, and depreciation is exceedingly moderate. The first cost of construction is not relatively great, and the returns are prompt and regular. Therefore, with small investment and low cost of operation, maintenance and depreciation, the telephone furnishes a stable security.

Not only is the security of an enduring nature, but its market value has been demonstrated in the last year where other stocks have depreciated terribly. Some three billion dollars have been squeezed out of listed stocks; yet even the Bell securities have held their own, in spite of years of mismanagement.

In every community, Independent securities have been unmolested. Surely, this is a test, vigorous enough to convince any skeptic.

The certainty of dividends has been proved. Very few companies have failed, although the development has been largely of a primitive nature. Rates have been raised where necessary, and the fact that people are generally willing to have them raised is a most satisfactory condition. Almost every company has it in its power to raise rates, if the people are taken into its confidence.

Anticipating that hard times may come, the decreased cost of materials and labor, which always accompany such conditions, will offset all losses due to its scourge. Circumstances seem to point to an equalizing process so that hard times will not affect the financial standing of the telephone.

Lastly, the idea of competition. For instance, a single railroad company connects two large cities. Before long, a competing system also builds a railroad. Finally three, four or five railroads are competing for the same business. Last of all, interurban electric roads parallel the various steam roads, and kill their local business.

It is plain to the observer of social conditions that there will not be more than two long distance telephone companies in competition, because the various towns and cities will not submit to more than two local plants. Accordingly, the world's telephone business will be limited to two companies.

It is said that the telegraph companies intend to go into the telephone business. If they do, they will have to get city exchange terminals. One cannot imagine that the American Union Telephone Company would be eager to grant exchange terminal privileges to concerns which propose to compete with their long distance wires.

With all these conditions in mind, I am sure all financial interests will place the telephone security first from the standpoint of market value, permanency and certainty of dividend paying power.

I am also very sure that the value of the Independent telephone security is greater than the most optimistic gentleman suspects, and that, at the lowest estimate, is not worth less than one hundred cents on the dollar.

An Ideal Rural Organization.

Editor SOUND WAVES: The Columbus (Mo.) Telephone Company was organized July 27, with Dr. J. M. Rice, president, N. H. Fulkerson, secretary, and Jo. Brockman, treasurer. There are at present seven farmer mutual lines in the company, with approximately 100 telephones. Each line is represented in the company by a trustee, and the seven trustees are empowered to conduct the business of the company. They have elected three of their members, directors, who will have active charge of affairs. Each line is entitled to as many shares in the company as it has telephones, and upon the payment of 50 cents per telephone as membership fee, the line patrons are entitled to flat rates, etc., which are denied those who do not care to become members. The company has purchased a 25-drop switchboard and the same is now being installed. Columbus connects with the Johnson County Home Company over a toll line to the Warrensburg office, and is also negotiating for toll connections with the neighboring towns of Holden, Odessa and Robins. The outlook for good service is very promising and the people of Columbus are proud of their company. S. T. B.

AMONG the anchors that stay in the ground, as well as in the eye of the public, the Miller anchor is predominant. It is the anchor that "stays put"—the testing period is an old, old story.

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Construction and Operation

By Charles Russell

THE small exchange ordinarily required in towns or localities furnishing 500 subscribers or less is a subject which is occupying the minds of engineers and operators possibly more closely than exchanges of larger sizes, from the fact that in large cities, where the revenues are sufficient to guarantee large expenditures, the exchanges, as well as the construction, are planned upon a broad basis, while small exchanges require careful consideration of the smaller details, because the revenue is less in proportion to the expenditure.

The small exchange must contemplate greater distances to reach subscribers, due to the fact that the surroundings, or rural territory, should be taken into account in order to give an interchange of business between the business men of the town and those with whom they do business in the country. The kind and class of service should be up to date and interchangeable, with trunk line service to the large city exchanges, as well as between all other small exchanges in adjoining territory. These conditions require that both exchange equipment and line construction must be up to standard or the exchange of service is poor and unsatisfactory, which produces discontent with the subscriber and eventually a withdrawal of the name from the subscribers' ledger.

Charles Russell.

The small exchange manager will find it impossible to continue an increase in business unless his subscribers are kept satisfied with the service given.

It will now appear that, first of all, the exchange equipment must be of such a character that it will give up to date service locally, and also work in harmony with trunk line service to the best equipment of large city exchanges, and it is self-evident that in order to do this the small exchange switchboard equipment must be of the best, and the construction of all its parts must be just as substantially made as the best of larger exchanges. Experience has proven that the use of small exchanges built and installed without a high grade of equipment, or with a low grade of insulation resistance, soon becomes practically inoperative in connection with trunk lines and the larger exchanges, which in many instances, on account of the inferiority of small or suburban exchanges, have been the means of general dissatisfaction to all subscribers on the city exchange, because of poor service to suburban territory.

The writer would recommend as much care in the installation of small exchanges as is exercised in exchanges of large cities, and would especially insist upon having all materials of the best and require as high quality of insulation resistance as can be secured, and have all parts of the equipment standardized, so as to operate in connection with the connecting exchanges, as though they were part of the same exchange.

It is not intended to convey the idea that suburban exchanges must contain the same equipment as the larger ones, but it is claimed that, while the signaling and supervising can be obtained by any convenient method, the transmission conditions can and should be the same, and that whatever apparatus is used it must be standardized with the parent exchanges.

The exchange equipment, while a necessary part of a system, does not constitute the whole system, for it is of equal importance that the construction work, including cables, open lines and installation, be looked after and accomplished with the same degree of perfection as is used with equipment, because any system is only as good as its weakest point. It would therefore be folly to exercise special care on exchanges and leave the cable or line insulation in poor condition.

Just here comes up the question of maintenance, which is the one account that eats up all the profits and gets its dessert or pie from the stockholders' pockets or allows the investor to be benefited by his investments.

The elements are great factors to be considered in maintenance, as it is wind, storm, sleet or a combination of these conditions, that cause such destruction to construction work and necessitates large maintenance accounts.

Cables underground cost more money than open line wires, but a cable underground and properly protected will not cost nearly so much to maintain as open wires, nor are they as liable to disturbing conditions which affect transmission. So, as a whole, the use of underground cables in all places where it is permissible by expense and revenue is recommended.

If there are no high potential lines to contend with, an aerial cable for twenty-five lines or more can be used to good advantage, but if there are trolley or lighting lines near the telephone route it will be much cheaper in the long run to put all cables underground. It is also necessary to protect the cable with good lighting protectors, as well as heating coil fuses, because it has been proven, and is still being demonstrated by a number of small companies, that a large percentage of cable trouble is caused by lightning entering cables that have not been properly protected, or from sneak or other foreign currents that would be avoided by the use of proper heating coil fuses. Let us assume that a cable properly installed, having a high insulation resistance, will remain in the same condition until interfered with; then if we can protect it in a manner to keep it in its original condition there will be practically no maintenance on cable excepting at the boxes.

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Cable makers will furnish any interested parties sufficient information to prove that cables are seldom over-protected, but are almost always under-protected, and many times what is used as a protection is really conducive to additional troubles. The fact that cable men are continually going over cables is conclusive proof that there is something wrong, either in the installation or protection of a cable, or from conducted currents or electrolysis.

Where it is necessary to build distributing pole lines they should be constructed of a good grade of chestnut or cedar, poles to be not less than seven-inch diameter at the top and not more than thirty-five feet long, excepting for special purposes, as the shorter the pole the less liable to storms' destruction, and a thirty-five foot pole is high enough for all ordinary purposes.

It has been amply demonstrated that poles set not more than 110 feet apart and fitted with good arms, have stood storm tests admirably.

It has also been proven that wires No. 10 B. & S. gauge, put up on double petticoated pony insulators, on thirty-five foot poles of 110 foot settings, have stood all kinds of weather conditions without damage unless caught by trees or other foreign objects thrown upon them by the elements.

It has also been computed that the expense of construction checked against the cost of maintenance of such a line as here mentioned about reaches the point of economy, from which it is recommended that lines of this nature be accepted as standard construction for pole line distribution.

The installation of instruments is an important factor in connection with every plant. The operation of any plant, be it small or large, is the all-important factor with the investors, as it is from this sheet of accounts that he sees good or evil forebodings.

The superintendent of a small plant must be general manager, engineer, traffic manager, construction superintendent and, in fact, everything in one, and it is not every man who possesses these all-around qualifications, hence the fact that some of the smaller companies frequently meet trouble.

It would be much better for small districts to join together in the formation of an association or operative company of sufficient magnitude to warrant the employment of special talent to manage the different departments. However, some small exchanges must exist and be operated.

It is necessary to secure help that is pleasant and congenial; those who help to build up a business instead of destroying it. Then it is necessary to watch the expenditures very closely to see that the revenues are not eaten up, and by all means see that each and every subscriber has efficient and satisfactory service. The lines and instruments must be kept clear of all troubles, so that interference will not occur, for there is nothing that will create adverse criticism sooner than inefficient transmission.

The manager should be willing to meet his customers half way in the adjustment of difficulties and not assume dictatorship over his patrons. Upon the whole, it is a business proposition and will respond to modern practices and policies the same as all other business enterprises.

Telephones Are Profitable in Manila.

The Philippine Islands are a veritable paradise for the exploiting capitalist, if statements sent out by the Philippine Telephone and Telegraph Corporation are true.

The company is offering for sale twenty-five gold bonds of $1,000 each, in order to secure money to be used in the extension of its plant at Manila.

The bonds are to bear 5 per cent interest, are to be sold at 95, and the purchaser will be given a premium of 20 per cent of the value of each bond in the corporation stock at par.

Quite an inducement to the investor! The corporation, together with the notice of the bond sale, sends out figures of the earnings of the company in order to prove that the bond investor is absolutely safe. Here are the facts and figures that make the American capitalist green with envy of the Philippine exploiter:

Total receipts in rentals and tolls from July 31, 1906, up to and including March 31, 1907 (pesos)	$ 69,338.50
All expenses, excepting interest on bonds (pesos)	21,752.88
Receipts minus expenses (pesos)	47,585.62
Gold	$ 23,792.81
Total of interest on all the bonds	9,110.00
Profit, pure and simple	14,682.81

By referring to the first figure given it is seen that the corporation's total receipts, measured in gold, were approximately $35,000.

Of this sum the Philippine corporation manages to save, approximately, $14,000. Stating it differently, 40 per cent of the receipts are pocketed by the owners.

But how are these fat profits made possible on such a small volume of business? The company has only 1,300 instruments in use in Manila. Such profits would be impossible in America with a business of equal size. How does the Philippine company do it?

The answer to this question is found in the low wage paid to labor.

Following is a comparison of wages paid in Manila and California:

	Manila.	California.
Linemen	$15	$ 91
Instrument men	22	91
Telephone installers	25	91
Records and mapping	25	100
Switchboard men	30	100
Laborers	11	78
Operators	10	32

And the working day is nine and one-half hours in Manila. In California it is only eight hours.

THE Jewell Electrical Instrument Company, Chicago, has issued a beautiful new catalogue of its current measuring devices. We never hear the name of the concern without recalling the smooth method of the Japanese. A few years ago a certain engraving house in Chicago missed the patronage of the Jewell Company. It had been doing the work at ordinary commercial rates, but investigation developed that a student in a local technical school had made a deep cut in the price. The drawing of dial scales is particular work for draughtsmen, and the student price eliminated the engraving house completely. After a lapse of time the same work sought the engraver, whose curiosity led him to ask the Jewell Company for an explanation. The answer came back with alacrity. It developed that the student was an emissary of the Japanese government, who had successfully copied the Jewell line for reproduction in his native country. In all probability he was sent to the United States for no other reason.

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C. B. Telephone on Magneto Line

By Arthur Bessey Smith

THE ideal telephone exchange consists of an A No. 1 switchboard to which are connected the best instruments obtainable and all of the same make. The latter point is one which most companies fail to observe, and the average telephone man must be familiar with all makes from A to Z and be able to make them work together harmoniously. From the standpoint of the installer and trouble man this is a distinct advantage,

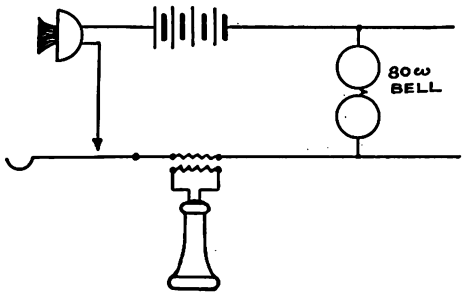

Figure 1.

as it puts him on his metal and gives him a training which he could receive in no other way.

But a case which came under my attention recently is a little out of the ordinary and should prove instructive. It is nothing less than the requirement of connecting a common battery desk set to a magneto line to be used as an extension telephone. The entire exchange was magneto and the line in question was an individual line. The subscriber wanted an extension set on his desk to save him the trouble of getting up to answer calls on the main instrument, which was under the charge of a clerk. The only available desk set at that time was a common battery set of very simple pattern. It contained only the transmitter, hook, induction coil and receiver, the last being on a local circuit with the secondary winding of the coil.

At first it was tried to make the set over into a local battery set, but the single contact of the hook soon

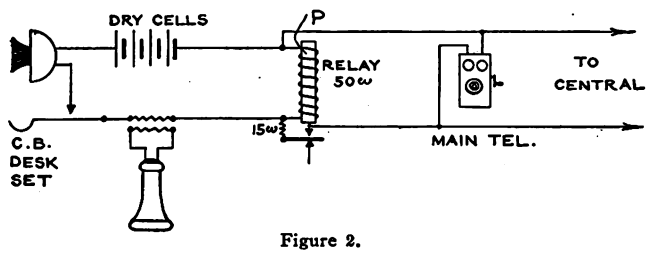

Figure 2.

put an end to that thought. The next consideration was to use it as it was and work it on the common battery plan, devising some means to keep the two ends of the circuit from interfering with each other. There must be a path for battery current through the transmitter without forcing that current to go all the way over the line to central and back again, for that would either require too much battery or weaken the current too much. If the main telephone had been a series telephone, the plan of Figure 1 would have worked very well. The 80-ohm bell acts in this case as a retardation coil, furnishing a path for the transmitter current from the battery, but choking out the high frequency voice current, forcing it to go on through the transmitter and induction coil, where it would be transformed to the receiver circuit.

But the bells of the main telephone were wound to 1,600 ohms, which was too high for any reasonable battery or transmitter. A retardation coil might be placed across the line and given a low enough resistance to serve for talking. But this low resistance would act as a partial short circuit on the line when ringing, as ringing current is of comparatively low frequency. Plainly, this retardation coil had to be disconnected from the line whenever the desk set was not in use. A hand switch was thought out of the question, as the user would forget nine times out of ten to open it.

The circuit shown in Figure 2 was designed to perform this duty. The relay performed the double action of retardation coil and switch. Normally the hook on the desk set was open, so that the relay was de-energized and the battery at rest. This left the main telephone line clear, except that the main telephone was permanently bridged across. When the receiver of the desk set was

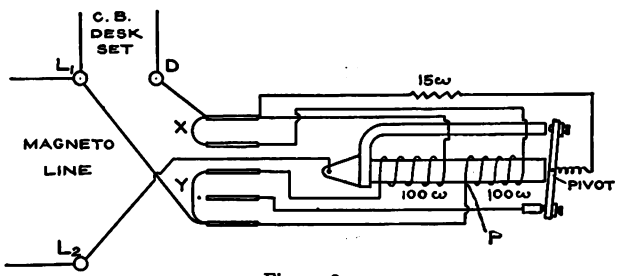

Figure 3.

taken from the hook the transmitter circuit was closed, thereby energizing the relay. In pulling up, the relay closed the contact which connected the set to the main line, and a conversation could be carried on. On hanging up the receiver the relay would fall back and clear the line.

The actual relay available was one which was made for a common battery switchboard and had two windings of 100 ohms each. These were placed in parallel so as to reduce their resistance to 50 ohms, which was necessary for the battery. The arrangement of the relay is

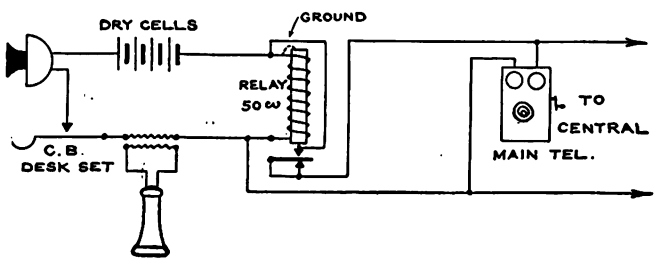

Figure 4.

shown in Figure 3. The 15-ohm resistance shown between the armature and one terminal of the coil was in the structure of the coil and was not disturbed, as it came in the main line and did not affect battery current. Its presence would not be noticed in talking.

This arrangement worked very well for a long time. Six dry cells did the work, and although the talk from

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the desk set was not quite as loud as from the main telephone, yet the service was satisfactory. But one day the line went dead short. Tests showed the trouble to be in the circuit to the desk set. By disconnecting the two desk set wires and the two line wires, Figure 3, L_1, L_2, and D, and testing with a receiver and dry cell, it was found that there was a cross between one of the coils and the core. It will be noticed that the core forms the front contact. By cutting the connecting straps, x and y, the ground was located on the right hand coil. Its terminals are the bottom and next to the top pins in the row of five shown. By noticing the loudness of the click the ground was thought to be nearest the bottom pin. By measuring with the bridge this was found to be the case. This located the ground at the point marked P in Figures 2 and 3. It was undoubtedly caused by the fact that as wired the core formed one side of the main line circuit and the coil the other side. During thunderstorms it would be more or less easy for lightning to puncture the insulation between the coil and the core, and it would

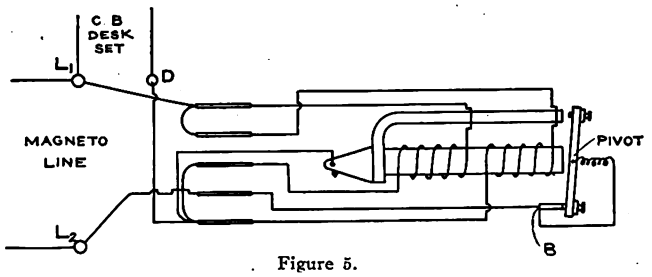


Figure 5.

be most likely to occur at the end of the coil next the line, which it did.

The circuit was then rewired so as to bring the ground where it would do no harm. This gave the circuit of Figure 4. In its normal condition there no longer exists any state of dielectric stress between the coil and the core, so that the trouble is unlikely to occur again. The 15-ohm resistance was cut out. The grounded end of the coil was permanently connected to the core to serve as one terminal for connection to the main line circuit. The insulated end of the coil and the armature form the two main line terminals, the latter being connected to the grounded end of the coil when the relay pulls up.

In Figure 4 the back contact of the relay is shown as connected to the armature, though the operation of the circuit would show no necessity for it. In Figure 5 is shown the actual rearranged wiring. The armature was tied to the back contact in order to utilize its terminal pin for carrying the circuit out of the relay shell, the back contact having no function to perform. The rearranged circuit works as well as the old one, and it is likely that if it had been wired this way at the start the coil might never have become grounded.

The Independent Independent.

Editor SOUND WAVES: Down in Missouri there are several Independent telephone companies that are "beyond the limit" when it comes to the meaning of the term Independent. They are *independent* Independents and their manner of conducting an exchange warrants this expression. They have good plants, sometimes incorporated, and in which the company owns the lines and the subscriber the telephone. The service is furnished at about cost and at present very few, if any, are making provision for a depreciation fund.

But that isn't the trouble so far as the real Independent movement is concerned. These so-called Independents have made and are using connections with any company that wants a drop on their board, Bell as well as Home, and refuse to disconnect one at the request of the other. Their claim is that they are Independent and care nothing for anybody's fight; that all they want is telephone connection—the more the better. If they can't reach the places wanted over one line they have a chance over another.

Such a course of procedure hurts the Home companies, but what can we do about it? We can't cut them out because of the effect on the city and town exchanges, and they know it. Perhaps in the sweet bye and bye they will see they have their hand raised against their friends and will then become one of us. Until that delightful time will some wise manager tell us through SOUND WAVES what we are going to do?—S. T. B.

Stadelman's Unique Sign.

The Norfolk Long Distance Telephone Company, a vigorous Independent organization at Norfolk, Nebraska, among whose members than whom W. J. Stadelman is not the least active, has adopted the sign illustrated herewith. It emphasizes in a strong way the "Long Distance" feature. The Norfolk company is purely a local operator, but it is going in on the theory that the public will forget its ability to render long

A "Shield Sign" of Decided Merit.

distance service unless it is made promiscuous from the start.

Mr. Stadelman's notion is genuinely good. A town generously illuminated with this big long distance fist, pointing always to the place where a public telephone may be found, will have a beneficial influence that will stand out strong on the right side of the ledger. This is a case of a subordinated shield, but you will observe that the shield makes a pretty fair looking cuff if it is properly adjusted. The sign we are showing devotes both sides to the telling of the same story. You can't get away from it, coming or going.

S. A. DINSMORE and George E. Lawton have purchased an interest in the Farr Telephone & Construction Supply Company, 118 West Jackson boulevard, Chicago, and a reorganization of the company has followed. A. D. Gibbs succeeds himself as president, S. A. Dinsmore is the new vice-president and general manager, and George E. Lawton is the new secretary-treasurer. The concern will enter actively into the telephone and electrical supply business. It will be recalled that Mr. Dinsmore has for the past fourteen years been associated with the Electric Appliance Company as engineer and manager of its telephone department. His many friends will be glad to learn of his newly formed connection with a long established and favorably known institution.

Recent Telephone Patents

By David S. Hulfish

863,617. Transmitter.—Rodney F. Ludlow, Philadelphia, Pa. Filed April, 1904. A single diaphragm operates as a receiver diaphragm and as a transmitter diaphragm to actuate a variable resistance button.

863,629. Drop and Jack.—James M. Overshiner, Chicago. Filed May, 1904. A shoulder on the plug engages a pivoted cam, which restores the drop shutter.

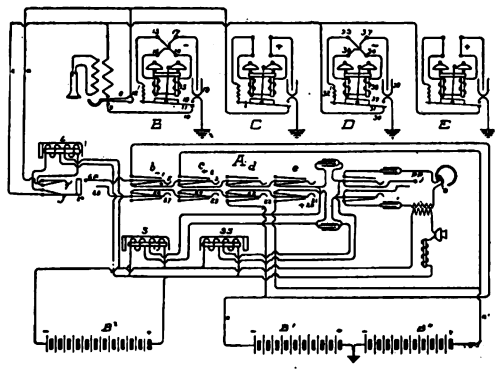
863,705. Telephone System.—Howard M. Eldred, Milwaukee, Wis. Filed March, 1906. A system of ringing central over a grounded circuit, with substation switch.

863,720. Ringer.—William Kaisling, assignor to Milo G. Kellogg, Chicago, Ill. Filed March, 1906. The armature is suspended from a yoke held by nuts threaded upon the projecting ends of the cores.

863,852. Transmission.—Isidor Kitsee, Philadelphia, Pa. Filed February, 1904. A system of communication over a single wire, without ground connection.

863,875. Selective System.—Sylvanus A. Reed, New York. Filed August, 1906. In ringing a biased bell through a condenser, the condenser charge and discharge rates are made different.

863,924. Selective System.—William W. Kidney, assignor to Century Telephone Construction Company, Buffalo, N. Y. Filed May, 1907. A polarized vibrating bell



863,924.

with condenser in series is used, the ringing being by direct battery current. (See cut.)

863,969. Cable Core.—William Dieselhorst, Old Charlton, and Arthur W. Martin, London, England. Filed March, 1904. A method of laying up pairs in a cable.

864,332. Attachment.—Albert S. Perry, Yukon, Okla. Filed March, 1907. A manual switch for local battery circuit, to be released by downward motion of hook, to permit listening upon party lines without rendering transmitter active.

864,382. Attachment.—John S. Mills, New Grenada, Pa. Filed January, 1907. A support for receiver.

864,454. Test System.—W. W. Dean, assignor to Kellogg S. & S. Co. Filed June, 1903. A system of automatic test for multiple switchboards.

864,530. Cable Grip.—Daniel H. Garber, Indianapolis, Ind. Filed January, 1907. The cable sheath is grasped by friction shoes, and pressure is applied through a system of levers.

864,599. Insulator Tie.—James W. Beckett, Little Rock, and William R. Beckett, Rose Bud, Ark. Filed November, 1903. A means for tying the line wire to the insulator.

864,713. Repeater System.—N. G. Warth, Columbus, Ohio. Filed January, 1907. A symmetrical arrangement of induction coil windings designed to reduce singing. (See cut.)

864,732. Attachment.—Joshua B. Hale, Providence, R. I. Filed June, 1906. A directory booklet to suspend from the transmitter.

864,765. Cable Hanger.—Richard Anteau, West Toledo, Ohio. Filed February, 1906. A Marlin hanger with metal hook for the messenger wire.

864,858. Receiver.—Herman G. Pape, New York. Filed June, 1904. A switch in the case of the head telephone is operated by engagement of a plunger with the head band.

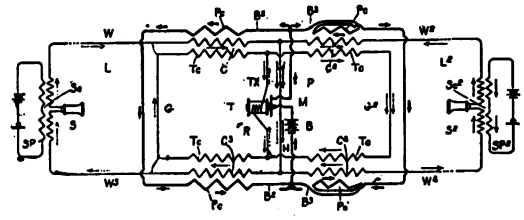
864,887. Supervisory System.—W. W. Dean, assignor to Kellogg S. & S. Co., Chicago. Filed January, 1904. A four-relay cord pair of novel arrangement of relays.

865,215. Transmission.—Daniel M. Therrell, Charleston, S. C. Filed July, 1904. A system of producing resonance for improvement of transmission.

865,379. Jack and Drop.—Emadia J. Grenier, Menominee, Mich. Filed April, 1906. A link pivoted behind the face plate is engaged by the plug and restores the shutter.

865,536. Selector.—C. E. Scribner and C. D. Enochs, assignors to Western Electric Company. Filed April, 1905. An automatic selector switch for central office switching.

865,697. Insulator. Robert E. Henderson and John N. King, Los Angeles, Cal. Filed May, 1906. A glass insulator has a grove of such conformation that a tie wire is not required.



864,713.

865,937. Receiver.—Edwin J. Quinby, Portland, Maine. Filed November, 1905. A sheet metal receiver case with hard rubber earplate.

866,036. Mouthpiece. Rudolph Knoll, Vienna, Austria-Hungary. Filed August, 1905. An elbow mouthpiece, rotatably attached.

866,138. Henry F. Joeckel, Clayton, Ill. Filed February, 1904. A party line system designed for ringing without disturbing conversation; three line conductors are used, or two wires and ground.

866,266. Telephone System.—W. W. Dean, assignor to Kellogg S. & S. Co. Filed June, 1903. A cord-pair without relays is shown, the supervisory lamps of the cord pair being controlled by the line relays.

866,577. Attachment.—Arlington D. Brittain, Youngstown, Ohio. Filed December, 1906. A receiver holder for wall sets.

866,596. Insulator.—William A. Morton, Los Angeles, Cal. Filed November, 1906. A glass insulator with straight groove through it, and means for retaining the line wire in the groove.

Telephones Under Water.

Many of the vessels that ply the Great Lakes are employing wireless submarine telephone service, in order to obtain danger signals during storms. At all the rocks and shoals are located lightships or buoys with big bells, which are rung during fog and bad weather, but often these are not heard, and a vessel may easily be misled. With the submarine telephone equipment, these bells can be heard for a distance of two or three miles. A telephone receiver is placed in the ship's pilot house, and transmitters are located in the lightships and buoys. Water is a better conductor of sound than air, and being below the surface, communication is not interrupted by wind, etc. The sound is conveyed to the receiver on the vessel with great distinctness, and the service has so far worked with success.

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Record of a Single Month

PERSONALS.

G. W. Sammons has resigned as manager of the Conway Telephone Company at Conway, Ark.

Fred A. Withers has been appointed manager of the exchange of the Peninsular Telephone Company at Bartow, Fla.

Charles Shirk has been promoted to the management of the exchange of the Independent Telephone Company at Morrison, Ill.

E. B. Carbin has been appointed general manager of the exchange of the Seneca Mutual Telephone Company, at Bascom, Ohio.

Manager H. H. Keys, of the Home Telephone Company, Albany, N. Y., has been elected secretary of the company to succeed H. J. Price, Jr.

Ferdinand Ernst has been appointed manager of the East Peoria (Ill.) exchange of the Independent Telephone Company, succeeding Clyde McNaught.

Max Zabel, E. E., sales manager of the American Electric Telephone Company, joined the benedicts September 26. Miss Isabell Lee shares in the congratulations.

Harry Hanford has resigned as manager of the Philippine Islands Telephone & Telegraph Company, Manilla, P. I. Attorney Hargis will take his place for the present.

John Brass will succeed W. L. Humphries as manager of the telephone exchange at Blackwell, Okla. Mr. Humphries will take charge of the telephone exchange in Tulsa, I. T.

W. D. Middlekauff has become manager of the Larned Telephone Company, Larned, Kans. He was formerly manager of the Farmers' & Merchants' Telephone Company, of Pawnee Rock.

H. S. Marsh, of the White Pine County Telephone Company, Ely, Nev., has resigned as manager. His successor has not been announced. It is rumored that the company is planning extensive improvements.

James A. Collins, formerly manager of the Taunton (Mass.) exchange of the Southern Massachusetts Telephone Company, has been promoted to the management of the exchange system of the same company at Brocton.

Paul D. Marlove, formerly superintendent of the system of the Galena Home Telephone Company, Galena, Kans., has accepted the position of general manager of the Senora Telephone Company, Hermosillo, Senora, Old Mexico.

C. S. Bundesman, formerly with the Dean Electric Company, is now with the Western Telephone Manufacturing Company, 25 West Jackson boulevard, Chicago. Mr. Bundesman will, doubtless, be pleased to hear from his old friends and customers.

Adolph Lynn Denniston, superintendent of equipment of the Utah Independent Telephone Company, Salt Lake City, invaded the home of Alfred Stromberg, September 18th, and carried away his charming daughter, Minnie. The ceremony followed in due course.

Claude Radley, who has been manager of the Northern Illinois Telephone Company at Earlville, Ill., has been appointed division manager, with headquarters at Mendota. He will have charge of the exchanges at Mendota, Earlville, Paw Paw, Leland and Troy Grove.

Among the many out-of-town friends who visited SOUND WAVES during the past month were: A. F. Poole, Wheeling, W. Va.; J. A. Harney, Cleveland, Ohio; Hunter Gary, Macon, Mo.; L. F. Crawford, Sentinel Butte, N. D.; W. H. Weller, Belingham, Wash.; E. J. Wagner, Ely, Nev.; Paul Latzke, New York; C. I. Blessing, Genoa, Ill.; H. A. Nutall, Henley, Ohio; W. H. McDonough, New York; S. A. Duvall, Toronto, Canada; S. A. Lichty, Vinton, Iowa; A. P. Eckert, New York; H. M. Eldred, Milwaukee; A. L. Denniston, Salt Lake City.

H. R. Sykes, general manager of several Independent telephone operating companies in Ohio, will join the sales organization of The Wire & Telephone Company of America during the current month. Mr. Sykes' long experience in the telephone field will prove a valuable asset in that it will be comparatively easy for him to convey his impressions of the excellent features of the Easophone equipments to exchange managers. Easophone equipments and telephone wire and supplies are being used so generally that it has been necessary to materially enlarge the sales organization of this progressive company.

E. W. Hurst, who, with C. W. Farr, founded the Farr Telephone Construction & Supply Company, in 1895, is now secretary and manager of the Farr Electric Equipment Company, Chicago, thus renewing his old association. These two gentlemen, through their association with the old company, became widely known and enjoy many friends earned by their sterling business principles in addition to their energy and push. The Farr Electric Equipment Company is reaching a broader field as it carries all manner of electrical supplies in addition to a full telephone line, and is now in position to supply all wants electrically.

The many friends of C. O. Harris, the well-known Independent telephone man, will rejoice to hear that he has again become active in the field. Mr. Harris went to Utah in March, 1904, as manager of the Utah Independent Telephone Company, and was a prominent factor in the development of that enterprise. After remaining with that company for two years, Mr. Harris resigned his position to accept the secretaryship of the Manufacturers' and Merchants' Association of Utah, becoming universally known throughout the inter-mountain region as "Get Acquainted Harris," through his activity as manager of the "Get Acquainted Excursions," which have been the means of getting the people of that section of the west fully acquainted with Utah's possibilities. During his many wanderings in the inter-mountain region, the lack of Independent telephone development impressed itself very strongly upon Mr. Harris' mind, until there seemed to be no alternative. He heard the "Call of the Wild" and decided to obey that call. After looking the field over, Mr. Harris has associated himself with the Fremont Independent Telephone Company, at St. Anthony, Idaho, and will assist that company in developing that splendid section of country in an Independent telephone way. Fremont county is one of the largest and most prosperous in Idaho, and has a population of nearly 25,000 already, being peopled largely by settlers from Ohio, Illinois, Iowa, Nebraska and other middle west states. The exchange at St. Anthony is now open and is up-to-date in every particular.

NEW COMPANIES.

LYONS, Ohio.—Articles of incorporation have been filed by the Lyons Telephone Company.

ETNA, Neb.—The Etna Mutual Telephone Company has been incorporated by C. O. Lind and others.

JOHNSTOWN, Neb.—The Johnstown Telephone Company has been incorporated by William Coryell and others.

CURTICE, Neb.—The Fox Creek Telephone Company has been incorporated. J. W. Adams heads the incorporators.

PARK RAPIDS, Minn.—The Park Rapids and Lake George Telephone Company has been formed with a capital stock of $1,000.

PARK RAPIDS, Minn.—The Park Rapids & Itasca Park Telephone Company has been incorporated by J. H. O'Neil and others. Capital, $25,000.

UNITY, Wis.—The Strum Telephone Company has been incorporated with a capital stock of $6,000. Incorporators, S. R. Anderson and ten others.

LEEDS, N. D.—The Star Line Telephone Company has been incorporated with a capital stock of $5,000, by S. Saunders, J. M. Fox and W. Conway, all of Leeds.

PADUCAH, Texas.—The Paducah Telephone Company has been incorporated with capital stock of $15,000. Incorporators, T. J. Richards, J. B. Earp and J. M. Barron.

POYNETTE, Wis.—The Poynette Telephone Company has been incorporated with a capital stock of $10,000. Incorporators, E. E. Hinkson, J. S. Hinkson and H. P. Jamieson.

TEMPLE, Okla.—Temple, Randlett & Fechiti Telephone Company has been organized with a capital stock of $24,000. Directors: V. L. Adair, J. W. Adair and W. H. Little, of Temple.

KENT, Wash.—The Kent Independent Telephone & Telegraph Company has been organized with a capital stock of $20,000, by A. T. West, J. Howard Snively and C. E. West.

OKEENE, Okla.—The Farmers' Exchange, of Okeene, has been organized with a capital stock of $25,000. The incorporators are: J. F. Kenney, S. H. Kratz, Wm. Walton and others.

CLAYTON, Ill.—Clayton Farmers' Union Telephone Company has been incorporated with a capital stock of $1,000. Incorporators, John W. Wallace, Chas. C. Cain and Henry J. Bockman, Sr.

MANITOU, Okla.—The Manitou Rural Telephone Company has been incorporated with a capital stock of $2,000, by P. P.

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Barlow, J. A. Parkinson, W. T. Webb, S. H. Harper and I. L. Given.

KORN, Okla.—The German Telephone Company has been incorporated with a capital stock of $1,500. The incorporators are: P. F. Kliewer, P. F. Franson, H. H. Dyck and John Balzer.

LEE'S SUMMIT, Mo.—The Lee's Summit Telephone Company filed articles of incorporation with the county recorder, at Independence. The capital stock is $32,000, divided into 320 shares.

RIDGETON, Okla.—The Ridgeton Telephone Company has been organized with a capital stock of $2,500, by J. W. Spencer, J. R. George, L. Burbe, of Ridgeton, and D. N. Wright, of Harrington.

VERMILLION, Ill.—The Stratton Mutual Telephone Company has been incorporated with a capital stock of $2,500. The incorporators are Owen J. Rowe, B. H. Huffman, E. Harris and Uriah Vance.

SHATTUCK, Okla.—The Northwestern Telephone Company has been incorporated with a capital stock of $15,000. The incorporators are: S. H. James, B. R. James, W. H. Springfield and O. H. James.

KENMARE, N. D.—The Greaves Telephone Company has been incorporated with a capital stock of $150,000. Incorporators: G. W. Greaves, O. Richards, both of Kenmare, and G. Johnson, of Donnybrook.

BERTHOLD, N. D.—The Crescent Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are F. F. Russell and L. V. Grey, Minot; H. M. Shirley, Berthold.

BRITTON, Okla.—The Britton Rural Telephone Company has been incorporated with a capital stock of $3,000. The directors are Dr. B. F. Stewart and Henry Hesley, of Britton; Geo. W. Gallet, of Edmond.

COATESVILLE, Ind.—The Coatesville Telephone Exchange Company has been incorporated with a capital stock of $1,500. The stockholders are H. T. Bohannon, S. Hunt, C. S. Hessler, G. W. Hunter and others.

ELLSINORE, Mo.—The Farmers' Telephone Company, of Carter county, has been incorporated with a capital stock of $3,000, for the purpose of building lines between Ellsinore, Homestead, Williamsville and other places.

MCHENRY, N. D.—The McHenry Telephone Company, with a capital stock of $15,000, has filed articles of incorporation. Among the incorporators are Anton Jenson, E. J. Horn, Chas. Burk, of McHenry, and others.

CHIPPEWA LAKE, Mich.—The Chippewa Lake Telephone Company has filed articles of incorporation with a capital stock of $2,000. The incorporators are J. F. Manahan, Edward Matiny, Robert Matiny, John Crawford and others.

RHEA SPRINGS, Tenn.—The Rhea Springs Telephone Company has been organized. The officers of the company are: J. G. Crumbliss, president; John M. Weing, treasurer; W. B. Williams, secretary; S. S. Brandy, general manager.

BENTON, Ill.—The stockholders of the Tri-County Telephone Company are planning to form a new organization. The following directors were elected: O. B. Martel, W. S. Means, Felix Dillon, J. E. Dixon, J. J. Pierce and Geo. W. Young.

LITTLE MEADOWS, Pa.—The Little Meadows Telephone & Telegraph Company has been incorporated with a capital stock of $1,000. Incorporators: A. D. Brown, Little Meadows; G. B. Palmer, Apalachin; G. H. Beebe, South Apalachin.

RINGGOLD, Pa.—The Ringgold Telephone Company has been incorporated in Hagerstown with a capital stock of $500. The incorporators are Jos. M. Newcomer, C. H. Leiter, E. Keller Mentzer and D. Martin, who are on the board of directors.

MADISON STATION, Ala.—A new telephone company is being organized in this city, by J. Williams and L. S. Hager. An exchange is to be established and lines built to Triana and other points. Connections are also to be established with Huntsville.

ROANOKE, Va.—The Roanoke County Telephone Company has been organized with a capital stock of $5,000. The officers of the company are: Monroe Grast, president; J. B. Andrews, vice-president; W. H. Moomaw, secretary and treasurer; T. L. Ininger, manager.

WENONA, Minn.—The Homer Rural Telephone Company has been incorporated with a capital stock of $5,0000. Lloyd Barber, president; O. S. Bundy, vice-president and J. H. Johnson, secretary and treasurer.

RANDOLPH, Utah.—The Utah & Wyoming Telephone Company has been incorporated with a capital stock of $10,000. The company will soon install a system to connect Woodruff, Laketown and Evanston. Wesley K. Walton is president and George Spencer is managing director.

RIVERHEAD, N. Y.—The Direct Line Telephone Company has been incorporated with a capital stock of $100,000. The company will manufacture telephone apparatus. The incorporators are: A. Koch Andriano, San Francisco; John A. Potter and Chas. W. Smith, New York.

LEICESTER, N. C.—The Leicester Telephone Company has been organized to construct, maintain and operate telephone lines in Buncombe and Madison counties. The authorized capital stock is $5,000 with $500 subscribed by Messrs. T. F. Reynolds, H. W. Gilbert and J. E. Patton, incorporators.

SYCAMORE, Ill.—Articles of incorporation have been filed by the Farmers' Exchange Telephone Company, and the entire amount of the capital stock, $25,000, has been subscribed. J. F. Winchester, of Sycamore, and W. P. Bean, of Waterman, have been active in the organization of this company.

OKLAHOMA CITY, Okla.—The Oklahoma Central Interurban Railway, Telegraph, Telephone, Light and Power Company, with a capital stock of $5,000,000, has been incorporated and expects to build a telephone line across the state. Its main offices are to be located at South McAlester and Oklahoma City.

TOCOWA, Miss.—An Independent telephone company, which has for its object the construction of a telephone system to connect Tocowa with Sumner, Charleston, Enid, Courtland and Pope, has been organized at this city. Among those interested in the new enterprise are E. R. Turner, D. Goodwin and others.

PRINCETON, Ont.—A new telephone company is applying for incorporation in Ontario under the name of the Princeton and Drumbo Telephone Company. It will establish telephone lines in Blenheim and Burford townships. Those mainly interested are T. J. Daniels, T. Convey, W. H. Wells and Walter Murray, of Princeton.

PINEDALE, Wyo.—Plans are being discussed for the formation of a new telephone company, which has for its object the erection of a telephone line from Pinedale to Rock Springs. Those interested in the new company are Charles Stevens and L. S. Trapp, of Boulder, and they expect to extend the system throughout the entire northern country, taking in South Pass and Lander.

OMAHA, Neb.—Plans are under way for the organization of a $1,500,000 Independent long distance telephone company, with headquarters at this place. It is expected that the lines will cover portions of the states of Nebraska, Iowa, Missouri and Kansas. The control of the new company will be in the hands of the men in charge of the New States Telephone Company, of Sioux City, Iowa.

MONTROSE, Colo.—A new Independent telephone company is being formed by the citizens of Horsefly, whose object is to build a line from Montrose to that city, a distance of about 23 miles. Connections are to be established with the Montrose system and lines will be eventually built to Norwood. The capital stock of the new company is $750, and among those interested in the project is L. J. Finch.

SALISBURY, N. C.—An Independent telephone company is being formed in this city and a franchise applied for. It expects to construct and maintain a long distance line connecting High Point, Statesville and Concord, and all points between these towns. Connections are also to be established with Lexington, Linwood, Thomasville, Spencer, China Grove, Troy, Taylorsville, Randleman, Mooresville, Landis and many other places.

ELECTION OF OFFICERS.

ATWOOD, Ill.—Vinton Garrett has been elected secretary and manager of the Atwood Mutual Telephone Company.

SUNNYSIDE, Wash.—The Yakima Valley Telephone Company has elected R. C. Lichty secretary to fill the vacancy caused by the resignation of George Irish.

REITZ, Pa.—The following officers have been elected by the Central Telephone Company: A. R. Wagner, president; Washington Custer, secretary; B. F. Lambert, treasurer.

BALDWIN, Wis.—The Farmers' Telephone Company, recently organized, has elected the following officers: H. C. Frihart, president; Taylor Looker, secretary; Arthur Looker, treasurer.

AURORA, Ind.—The directors of the People's Telephone Association have elected Colonel Jacob M. Bauer as president, to fill the vacancy caused by the death of the late George H. Roberts.

HACKETTSTOWN, N. J.—The Hackettstown Telephone & Telegraph Company has elected the following directors: S. B. Darnell, F. T. Atwood, Arthur Danks, W. A. Hoffman, W. J. Barker and others.

RICE LAKE, Wis.—The newly elected officers of the Rice

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Lake & Northeastern Telephone Company are: W. H. Bundy, president; W. E. Horsman, secretary and general manager; E. J. Everts, treasurer.

ENTERLINE, Pa.—The Enterline-Halifax Telephone Company has elected the following officers: J. A. Hoffman, president; Prof. J. T. Hoffman, vice-president; C. F. Harman, secretary and general manager; A. M. Hoffman, treasurer.

RAYMOND, Me.—The following officers and directors have been elected by the Raymond & Webbs Mills Telephone Company: L. N. Jordan, president; F. H. Witham, treasurer; directors, C. S. Jordan, E. L. Skillin and C. K. Thorp.

ALBANY, N. Y.—The United Message Company, the holding company of the Home Telephone Company, has elected the following officers: T. M. Brush, president; I. G. Griswold, vice-president; Howard Hendrickson, secretary-treasurer.

MASON CITY, Ill.—The Mason City Telephone & Telegraph Company has elected the following officers: H. F. Reason, president; C. W. Cargill, vice-president; J. F. Culp, secretary and manager. Directors: Albert Cross, G. C. Ely and W. A. Grandy,

LENA, Wis.—At the recent meeting of the Farmers' & Merchants' Telephone Company, the following officers were elected: J. N. Bassett, president; J. P. Brazeau, vice-president; Dr. J. C. Grant, treasurer; John Ankerson, secretary; Carl Schoenebeck, manager.

GRAFTON, N. D.—The Martin Township Rural Telephone Company, recently organized, has elected the following officers: James Hanson, president; Frank McAulley, treasurer; O. A. Rod, secretary. Directors: Theo. Nelson, J. W. Rogers, O. B. Knudson.

HILLSBORO, Ill.—The newly elected directors of the Peoples' Mutual Telephone Company have elected the following officers: Geo. D. Taylor, president; M. L. Moyer, vice-president; Robert P. Barnard, secretary and general manager; A. K. Vandiver, treasurer.

SYRACUSE, N. Y.—The following officers were elected at the meeting of the New York Interstate Telephone Association: J. S. Griswold, president; Wilbur H. Johnson, vice-presdient, Buffalo; R. Max Eaton, secretary, Niagara Falls; Geo. R. Fuller, treasurer, Rochester.

KENNEY, Ill.—The Kenney, Chestnut & Farmers Telephone Company has elected the following officers, at its annual meeting: D. H. Lahr, president; John Townbridge, vice-president; A. J. Blangy, secretary; W. B. Montgomery, treasurer. A. P. Dericks has been elected director for three years.

CAMBRIDGE SPRINGS, Pa.—The officers of the Cambridge Springs Electric Telephone & Telegraph Company are: A. H. Matteson, treasurer; D. E. Kelley, president; C. W. Jones, secretary and manager. Directors: D. E. Kelley, C. W. Jones, A. H. Matteson, Otto Kohler and Fenton King.

BUTLER, Pa.—At the annual meeting of the stockholders of the Peoples' Telephone Company, the following officers were elected: A. L. Reiber, president; J. Henry Troutman, vice-elected: A. L. Reiber, president; J. Henry Troutman, vice-Baker, secretary; and J. E. Forsythe, general superintendent.

NEW CONSTRUCTION AND EXTENSION.

JOHNSON CITY, Tenn.—The Bristol Telephone Company will enlarge its plant.

FORREST, Ill.—The Forrest Mutual Telephone Company will have its system rebuilt.

CRESTED BUTTE, Col.—The Crested Butte Telephone Company will extend its system to Aspen.

LEBANON, Kans.—The Exchange Telephone Company will install a modern up-to-date switchboard.

PALMYRA, Wis.—The Eagle Telephone Company is preparing to make some extensive improvements.

BOLTON, Conn.—The Bolton & Coventry Telephone Association contemplates the erection of a new line.

RAZORVILLE, Me.—The lines of the Washington Telephone Company will be extended in and about Razorville.

EUNICE, La.—The Sibile Telephone Company will make extensive repairs and put in new lines and telephones.

SALT LAKE CITY, Utah.—The Utah Independent Telephone Company will expend $75,000 on its new installation.

LEAVENWORTH, Kan.—The People's Home Telephone Company will install a new system at Fort Leavenworth.

PONTIAC, Ill.—The Home Telephone Company will build a line from Pontiac to Chenoa and Fairbury via Weston.

PEKIN, Ill.—The Citizens' Telephone Company is building a new farmers' telephone line between this city and Prairie.

KENMARE, N. D.—The Greaves Telephone Company will construct a number of new telephone lines in the near future.

FORT MEADE, Fla.—The Fort Meade Telephone Company will make many extensions in its system. Mr. Reif is manager.

REDLANDS, Cal.—The Southwestern Home Telephone Company will expend about $50,000 for extensions and improvements.

KEOKUK, Iowa.—The Mississippi Valley Telephone Company will install an entire new system of wires, telephones and apparatus.

DENTON, Texas.—The Home Telephone Company is planning many extensions in its system. The entire plant will be renovated.

FLORENCE, Neb.—The Independent Telephone Company is contemplating the erection of a three story exchange building in this place.

DECATUR, Ill.—Dr. J. W. Collins, president of the Home Telephone Company, will install an automatic system at a cost of $100,000.

DESHLER, Neb.—The National Telephone Company will install a telephone system at this place. Percy Adams has charge of the work.

MATOON, Ill.—The Coles County Telephone & Telegraph Company will install a new switchboard and build an exchange at this place.

LEXINGTON, Ill.—Among the improvements planned by the Lexington Home Telephone Company is the installation of a new switchboard.

DECORAH, Iowa.—Over eight thousand feet of cable is to be placed in the conduits by the Delaware County Telephone Company at this place.

SABETHA, Kan.—Plans are being considered by the Sabetha Mutual Telephone Company for the erection of a line from that city to Seneca.

YOUNGSTOWN, Ohio.—The Columbiana County Telephone Company will construct a new line from East Palestine through to Enon Valley, Pa.

NORWICH, N. Y.—To accommodate the rapidly growing business, the Norwich Independent Telephone Company is erecting a new exchange building.

KNOXVILLE, Tenn.—Several thousand feet of cable is to be used by the People's Telephone & Telegraph Company in the extension of its system in this city.

MILWAUKEE, Wis.—Bridge Superintendent Murray annonces that an Independent system of telephones will be installed on the different bridges of the city.

PASADENA, Cal.—The Home Telephone Company promises to make extensive improvements in the near future and has increased its capital stock to $1,000,000.

WAUKON, Iowa.—The Standard Telephone Company will rebuild its city exchange, purchase a new switchboard and sufficient cable to supply the business streets.

GRANT CITY, Iowa.—The Farmers' & Merchants' Mutual Telephone Company will improve its telephone service. The company will purchase a new switchboard.

TARBORO, N. C.—C. P. McCluer, manager of the Carolina Telephone & Telegraph Company, announces that the company will install an up-to-date exchange at La Grange.

MARTIN, N. D.—The Martin Telephone Company has asked the city council for permission to erect a telephone exchange here and to build country lines through McLean county.

SEARCHLIGHT, Nev.—The Searchlight-Western Telephone Company has found it necessary on account of the increased business to replace its poles. Heavier ones will be put in.

DECATUR, Ill.—The Independent Telephone Company will construct an underground telephone system at this place. It will be one of the largest systems in the state outside of Chicago.

HEMLOCK, Mich.—The exchange of the Union Telephone Company is to undergo many improvements, and the plant of the company in this city is to be made first-class in every particular.

LONGVIEW, Ill.—The Independent Telephone Company, which has exchanges at Tuscola and other towns in the immediate vicinity, contemplate the erection of a line from Villa Grove to Longview.

NEW CASTLE, Ind.—R. R. Faulkner, general manager of the New Castle Telephone Company, announces that the company will extend its city lines and will construct toll lines to Middletown, Anderson and Muncie.

PERRYVILLE, Ark.—The Choctaw Telephone Company, of Perry, will have its lines overhauled and put up new poles and wire at this place. The company will put in an exchange office at both Perry and Perrysville.

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GLASGOW, Ky.—Travis Taylor and W. R. Gardner, of Morgantown, Ky., are trying to establish a telephone system at this place. They propose to put in a $10,000 system if the citizens will raise half the money.

WINNIPEG, Man.—The Manitoba government has given the contract for the erection of its new telephone exchange at Winnipeg to James M. and John J. Kelly, of that city, the price being $97,112, including everything except plumbing and heating.

MADISON, Ind.—The Madison Telephone Company is completing a modern building in which it will install new equipment. The company discontinued its service with the Bell company October 1, and returned its transmitters and receivers.

PELICAN RAPIDS, Minn.—The Pelican Telephone Company has been erecting new lines north and west of this city all summer and has in contemplation the construction of many more lines this year, as well as other improvements in its system.

GALVESTON, Texas.—The local telephone system will be reconstructed and a new switchboard and other equipments will be installed. The greater part of the wires will be removed and replaced with new ones. W. E. Mark has charge of the work.

PONTIAC, Mich.—The Oakland Telephone Company will expend about $136,000 on its system in this city. The company will rebuild its exchange and its lines, new cables will be added, a new switchboard installed, and the plant made thoroughly up-to-date.

HARTLAND, Minn.—Plans are being considered by the Hartland Telephone Company for the extension of its line from its present terminus, northwest of Freeborn, into Matawan, and from there west, where connection will be made with the Wells telephone line.

DURAND, Wis.—The recently organized Inter-County Telephone Company will construct lines into Pepin, Buffalo and Dunn counties. It has also obtained and will operate the lines outside of the city limits, formerly owned by the Light and Power Company.

HUNTINGTON, Ind.—The United Telephone Company will spend $10,000 in improving its system at this place. A four-hundred-pair cable will furnish lines for the eastern part of the city. The capacity of the Bluffton and Marion exchanges will also be increased.

BOWLING GREEN, Ky.—The Home Telephone Company will spend $20,000 in improving its system. The company will install a new ringing machine in its exchange and will increase the capacity of its switchboard. A lot of outside and underground cable will be installed.

WILLOW, Cal.—The Colusa County Telephone Company will build a telephone system at this place. C. L. Schaad, president, has charge of the work. The company will enter Butte City, Hamilton, St. John, Orland, Germantown, Newville, Elk City, Fruto and other places.

DECORAH, Iowa.—The Standard Telephone Company, which has been making many improvements in its lines at other points, expects to install a new switchboard at Decorah, and to entirely rebuild its exchange. The extension of its lines throughout the city is also contemplated.

HACKETTSTOWN, N. J.—The Hackettstown Telephone & Telegraph Company, whose lines extend to Allamuch on the north, and to Rockport on the west, will construct a line to German Valley, where connections will be effected with the Morris County Telephone Company.

OREGON CITY, Oreg.—The Home Telephone Company will construct new lines to connect with the Mollolla and Beaver Creek Mutual Telephone Company, the Clear Creek Mutual Telephone Company, the Highland Telephone Company, the Canby Telephone Company and others.

BRANTFORD, Ont.—General Manager MacKay of the Independent Telephone Manufacturing Company announces that the company will have an automatic system in operation here by the end of the year. The company has purchased a site for its new building which will cost $8,000.

PARIS, Texas.—The Texas Oklahoma Telephone Company, recently organized, will build telephone lines from Paris to Hugo, thence west along the A. & C. railroad through Durant into Sherman, Texas. Going east from Hugo, the company will extend its lines to Texarkana, Ark.

COVINA, Cal.—A lot has been purchased by the Home Telephone Company, upon which it expects to erect a branch, to be operated in connection with the Covina exchange. A thoroughly up-to-date system is to be installed, representing an expenditure of something in the neighborhood of $12,000.

SUCRE, Bolivia.—A concession has been granted by the Bolivian government to Senor Leopold Meyer, to construct telegraph and telephone lines for the railways. Senor Meyer's address is not stated, but he could be addressed care of the Minister of Finance and Industry, Sucre, Bolivia, S. A.

WATERLOO, Ind.—The Waterloo Home Telephone Company, newly organized, contemplates the installation of an up-to-date plant in this city, and the establishment of toll connections with all towns and cities reached by the wire of the Home Telephone Company of Ft. Wayne, including Angola, Ashley and other places.

TORREON, Mexico.—John Woessner, proprietor of the telephone system in this city that bears his name, will construct a long distance telephone line between Torreon and Durango. Mr. Woessner has made arrangements with the telephone system of the city of Monterey for connections and work will commence in the near future.

ALBION, Mich.—Edmund Land, a consulting engineer of Grand Rapids, and L. C. Smith, of the Home Telephone Company, are planning to establish an Independent telephone system at this place. The new system will be the best and most up-to-date that can be secured. The wires will be underground in the business portion of the city.

SALISBURY, N. C.—The Independent telephone companies operating exchanges at Statesville, Taylorsville, Concord, Highpoint, Lexington, Troy, Ashboro and other small places, will combine in the construction of long distance lines between all these places. The lines are to pass through Salisbury, where a number of toll stations will be maintained for the use of the public.

COLUSA, Cal.—The Colusa County Telephone Company, which has just completed a line from Colusa to Williams, will begin the construction of the Williams exchange. Six new switchboards are to be installed in the company's various exchanges, a new line built from Colusa to Princeton and the system extended in various other directions throughout the county.

MILESTONE, Sask.—The farmers at several centers will build radial lines converging into Milestone and linked together by an exchange there. The first company to be organized on this basis is the Farmers' Mutual Telephone Company, of which C. Nicholson is president and H. Underwood, secretary-treasurer. Another company is the Buck Lake Mutual, with J. F. Reid, president; L. O. Bryant, vice-president, and J. F. Stratton, secretary-treasurer.

FRANCHISES AND TRANSFERS.

FESSENDEN, N. D.—S. H. Hagen has been granted a franchise for a local telephone system at Plaza.

BRITT, Iowa.—R. M. Dutcher has sold his exchange at this place to A. Exkles, of Nora Springs, Iowa.

CASHTON, Wis.—Mr. Cramer, of this place, has bought out Hall & Steele's Cashton telephone exchange.

LINTON, N. D.—The Dakota Central Telephone Company has purchased the telephone exchange at Forbes.

SHERIDAN, Ark.—The Sheridan Telephone Company has been purchased by J. B. Shaw and Geo. W. Walker.

OAKESDALE, Wash.—The city council has granted a 15-year franchise to the Farmers' Telephone Exchange Company.

GRANITE FALLS, Minn.—D. N. Tallman, of Wilmar, has been granted a franchise to build a telephone line into this place.

VANCOUVER, Wash.—The Home Telephone Company has applied for a franchise for a telephone system at this place.

WAGONER, I. T.—R. J. Moore, of Magnolia, Ark., representing the new telephone company here, has asked for a franchise.

CINCINNATI, Ohio.—The Southern Ohio & Tristate Telephone Company has made application for a franchise in Silverton.

POCATELLO, Idaho.—An ordinance has been passed granting the Utah Independent Telephone Company a franchise at this place.

KINGSTON, Ill.—John Plane, of Belvidere, representing the Rural Telephone Company, has been granted a franchise to install telephones at this place.

HOULTON, Me.—The stockholders of the Independent Telephone Company voted to sell all the company's lines to the Aroostock Telephone Company.

JEFFERSONVILLE, Ind.—The Home Telephone Company, recently organized, has been granted the franchise to install and operate a local telephone plant.

EAST TORONTO, Can.—Application for a franchise to establish and maintain a telephone system in this city has been made by the Independent Telephone Company.

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Middleboro, Ky.—The telephone franchise which has been for sale at this place, has been sold to C. W. Chandler, of London, Ky., for $650. Mr. Chandler operates telephone systems in London and Pineville.

Paris, Ill.—A deal has been completed whereby Milton Collier, of Dana, Ind., has acquired the properties of the Embarrass Telephone & Telegraph Company, including the exchanges at Boston, Isabel, Redmon, Oakland and Kansas. The properties are valued at $57,000.

Milwaukee, Wis.—C. J. Chapin, secretary of the Milwaukee Independent Telephone Company, University Building, has recently bought the Walworth County Telephone Company, Delavan, Wis., which has 300 city telephones and a number of farmer lines and several miles of toll lines. The company's long distance connection is the Badger State Telephone Company.

FINANCIAL.

Modoc, Ind.—The Modoc Telephone Company has increased its capital stock from $7,500 to $10,000.

Holly, Mich.—The Inter-State Telephone Company has made application for a franchise at this place.

Table Rock, Neb.—The Table Rock Telephone Company has recently increased its capital stock to $20,000.

Middleton, Ohio.—The Middleton Telephone Company has increased its capital stock from $10,000 to $300,000.

Creston, Ill.—The Tri-County Mutual Telephone Company has increased its capital stock from $2,500 to $6,000.

Oil City, Pa.—The Petroleum Telephone Company recently declared its eighth regular quarterly dividend of 1½ per cent on its preferred stock.

Grand Rapids, Mich.—The Citizens' Telephone Company at a recent meeting decided to raise the authorized capital stock from $2,000,000 to $3,500,000.

Ozark, Ark.—At the recent annual meeting of the Home Telephone Company a dividend of 5 per cent was declared. Herman Elche is the new manager of the company.

De Kalb, Ill.—The new Exchange Telephone Company announces that the full amount of $25,000 worth of stock has been subscribed. The company will look for business entirely in the county.

Rock Grove, Ill.—The Rock Grove Farmers Mutual Telephone Company has increased its capital stock from $1,200 to $6,000. The number of directors has been increased from three to seven.

York, Neb.—The York County Telephone Company has declared its ninth semi-annual dividend of 4 per cent. The net earnings on the amount of stock issued is equivalent to 6½ per cent for the past six months.

Rochester, N. Y.—The United States Telephone Company has declared regular quarterly dividends of 1½ per cent on preferred stock, payable October 15th, and ¾ of 1 per cent on the common stock, payable October 25th.

Philadelphia, Pa.—The Keystone Telephone Company's statement of operations for the year ended June 30, shows gross earnings of $995,752, operating expenses and taxes, $518,691; net earnings, $477,061, and net surplus $107,740.

Bevier, Mo.—The stock formerly owned by L. F. Coulter in the Bevier Telephone Company has been acquired by a number of local business men. The system, which is to be run under the same name, is to be materially improved.

Fenwick, Mich.—The Fenwick Telephone Company has increased its capital stock from $8,000 to $50,000, and will hereafter be known as the Home Telephone Company of Palo. The company will establish an exchange at Hubbardston.

New Castle, Pa.—The stockholders of the Plaingrove Telephone Company will increase their capital stock from $5,000 to $25,000 on account of the demand for enlarging the system. Connections will be made with the New Wilmington Telephone Company.

Waterloo, Iowa.—The Corn Belt Telephone Company has voted to increase its capital stock from $300,000 to $500,000 to provide for increasing business. The officers of the company are: A. T. Averil, president; S. S. Lichty, secretary; J. H. Shoemaker, manager.

Los Angeles, Cal.—The quarterly dividend of the Los Angeles Home Telephone Company amounted to $31,250. The company has a capitalization of $3,000,000, of which $2,500,000 is issued. The rate of dividend is 5 per cent, payable in quarterly installments of 1¼ per cent.

Ely, Nev.—The directors of the White Pine Telephone Company has voted to increase the capital stock from $75,000 to $300,000 so that the company might carry on its improvements. The officers are Frank C. Armstrong, president; John Weber, secretary; and W. V. Lockwood, manager.

Cleveland, Ohio.—Directors of the Cuyahoga Telephone Company have declared the regular quarterly dividends of 1½ per cent on the preferred stock, payable October 30 to stock on record October 15, and 1 per cent on the common stock, payable October 25th to stock of record October 1.

Redlands, Cal.—The stockholders of the Southwestern Home Telephone Company, have authorized the creating of a bonded indebtedness of $1,000,000. Of this $100,000 is to be used in paying up the company's debts, and the remainder is to be used for further extensions and improvements.

Grand Rapids, Mich.—The annual report of the fiscal year ending June 30, shows the Citizens Telephone Company as having gained $559,908.73. The board of directors for the coming years are: C. F. Rood, R. Fisher, Phillip Graham, Edward Fitzgerald, J. B. Ware, G. W. Perkins and others.

Aledo, Ill.—The Peoples Telephone Company of Mercer county has decided to increase its capital stock to $20,000. The following officers were elected: Dr. N. C. Reynolds, president; R. L. Watson, vice-president; Wm. McManus, secretary-treasurer. Directors for the company for the year are George Boll and L. N. Lewis.

Newark, Ohio.—At the regular monthly meeting of the directors of the Newark Telephone Company, the regular quarterly dividend of 2 per cent on the common stock of the company was authorized to be paid October 1 to all common stockholders of record September 30. This company is capitalized for $60,000 common stock, and $90,000 preferred stock, the former drawing dividends at the rate of 8 per cent per annum, payable quarterly, and the latter at 6 per cent payable semi-annually.

MISCELLANEOUS.

Twin Brooks, S. D.—The Farmers Telephone Company will locate its central office at this place.

St. Peter, Minn.—The exchange of the Nicollett County Telephone Company has been badly damaged by fire.

Camden, N. J.—The Rensselaer Telephone Company recently sustained quite a loss by fire, which put its entire system out of commission.

Cameron, W. Va.—The National Telephone Company has formed arrangements with the Cameron Telephone Company whereby the latter company is given connections with Wheeling and all other points in the National line.

Kanawha, Iowa.—Arrangements have been made by the Norway Rural Telephone Company with the Hancock Rural Telephone Company for connections at Kanawha which will insure an extended service for both companies.

Doylestown, Pa.—The Keystone Telephone Company of Philadelphia has just opened a modern exchange here. The system in this section now reaches Easton, Bethlehem, Allentown and Wilkesbarre and is being rapidly pushed to the smaller towns and borroughs.

Harrison, Ohio.—Independent telephone interests, represented by C. W. DeArmond of Hamilton, have secured an option on the Harrison Telephone Company of Harrison, a suburb of Cincinnati. The company has a large number of telephones, and reaches into two Indiana counties.

Grand Rapids, Mich.—The executive committee of the Independent Telephone Managers' Association, of Michigan, met in the exchange building of the Citizens Telephone Company. The date of the next annual meeting of the Association was set for November 13 and 14. It will be held at Battle Creek.

Henderson, Ky.—The Henderson Telephone & Telegraph Company will consolidate with the Central Home Telephone Company. About $50,000 will be expended on improvements and underground wires will be put down on several blocks. Lines will be extended in the towns of Spottsville and Corydon.

South Bend, Ind.—The Home Telephone Company has about completed some very much needed and valuable extension work. It consists of a 30-mile line to Cassopolis, where connection is made with a newly constructed 85-mile line of the Citizens Telephone Company of Grand Rapids, Mich. This north and south toll line is being met by the Southern Michigan Telephone Company, headquarters at Burr Oak, and under the able management of A. C. Himebaugh. These lines are the best construction, using No. 10 copper, full metallic, setting the poles 40 to a mile. The line is very much needed as it opens practically all of Michigan to the well developed Indiana territory. The Home Telephone Company is also developing the entire Berrien county, radiating from Niles, Michigan.

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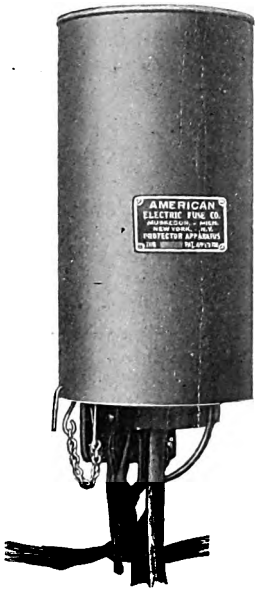
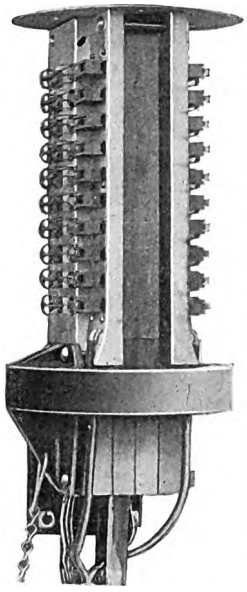
A WINNER



Type F

It Saves You



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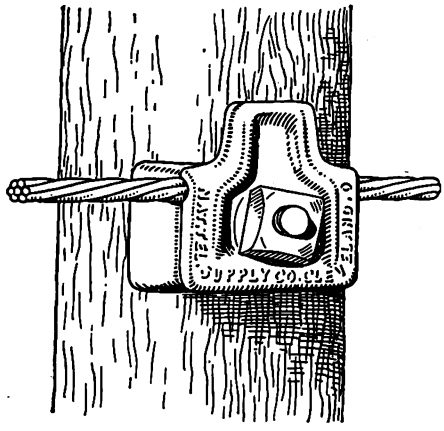

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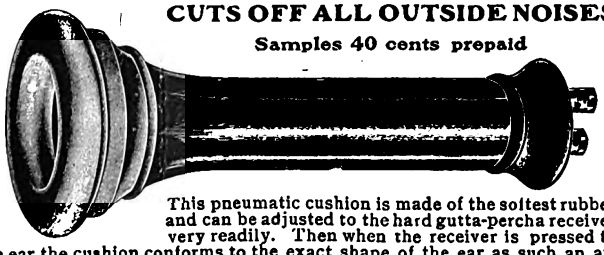

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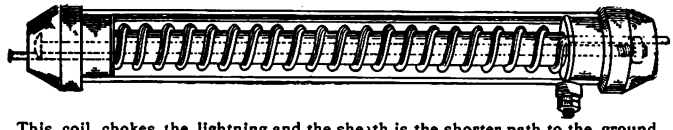

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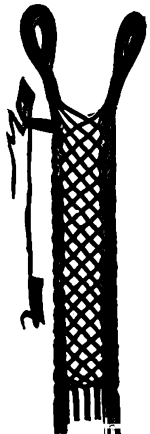

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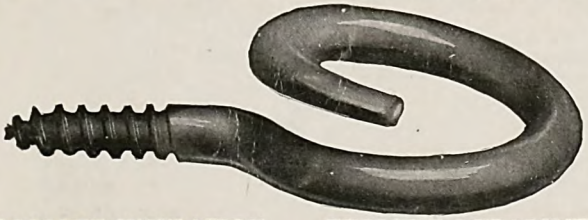

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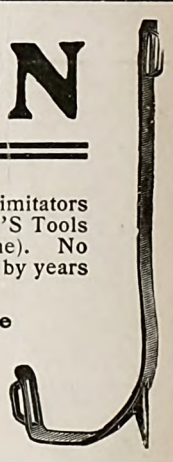

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SOUND WAVES

VOLUME XIV
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NOVEMBER 1907

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CHICAGO, NOVEMBER, 1907

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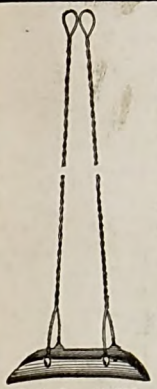

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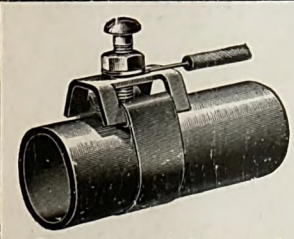

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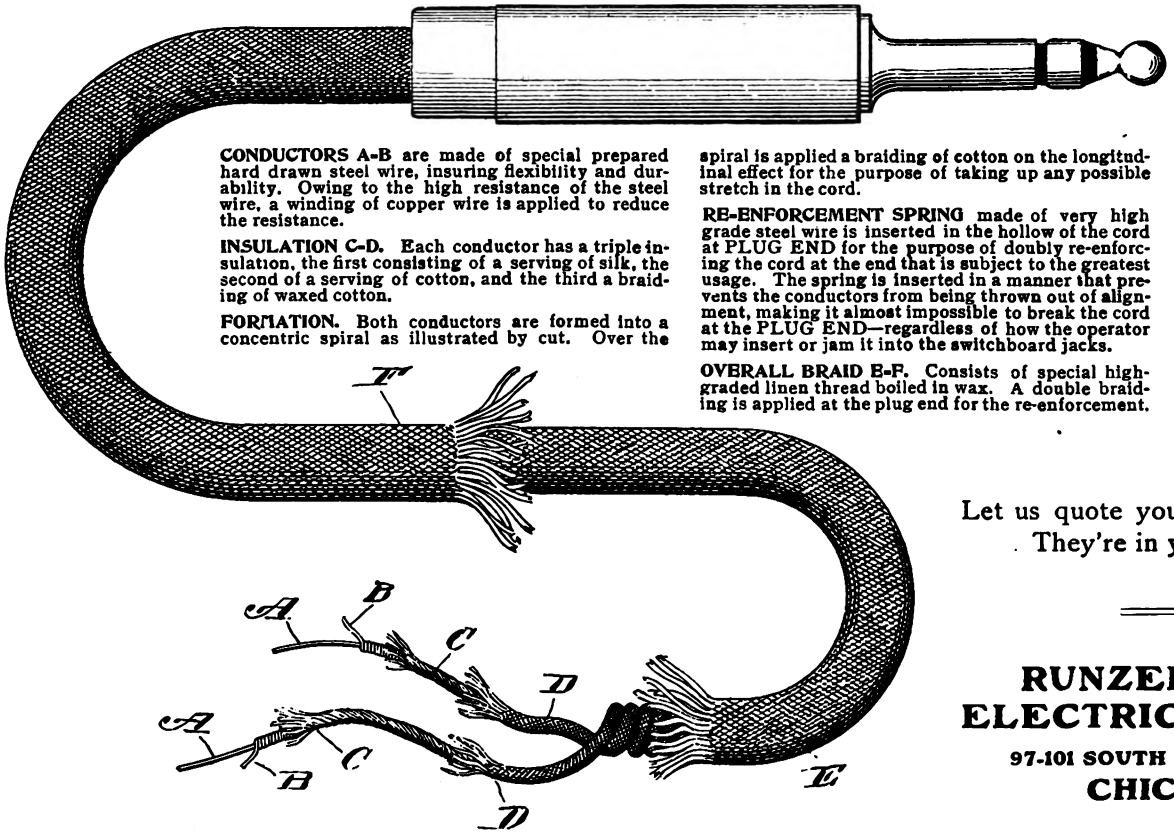
PREMIER BB STEEL CORD



CONDUCTORS A-B are made of special prepared hard drawn steel wire, insuring flexibility and durability. Owing to the high resistance of the steel wire, a winding of copper wire is applied to reduce the resistance.

INSULATION C-D. Each conductor has a triple insulation, the first consisting of a serving of silk, the second of a serving of cotton, and the third a braiding of waxed cotton.

FORMATION. Both conductors are formed into a concentric spiral as illustrated by cut. Over the spiral is applied a braiding of cotton on the longitudinal effect for the purpose of taking up any possible stretch in the cord.

RE-ENFORCEMENT SPRING made of very high grade steel wire is inserted in the hollow of the cord at PLUG END for the purpose of doubly re-enforcing the cord at the end that is subject to the greatest usage. The spring is inserted in a manner that prevents the conductors from being thrown out of alignment, making it almost impossible to break the cord at the PLUG END—regardless of how the operator may insert or jam it into the switchboard jacks.

OVERALL BRAID E-F. Consists of special high-graded linen thread boiled in wax. A double braiding is applied at the plug end for the re-enforcement.

The Only Successful Steel Cord

Let us quote you our new prices.
They're in your favor.

RUNZEL-LENZ ELECTRIC MFG. CO.
97-101 SOUTH CLINTON ST.
CHICAGO

TELEPHONE LEASE RECORD

NAME	Lines	Telephones	Extension Bells	Party Lines	Long Distance	Private Lines	JANUARY	FEBRUARY	MARCH	APRIL	MAY
E. F. Sedgwick	5	5	Reg	1st	3-1-06		1 5c 4 40c 3 1/2 2 1/2 1/2	1 5c 1/2 10c 1 10c 1 1/2	1 15c	2 90c	1 15c 1/2
S. P. Sedgwick	5	2	1 Reg	2nd	3-1-06		2 1 1/2 3 1/2 3 1/2	2 1 30c 3 30c 3 30c	1 90c		
E. C. Hedwig	9	1	6 Reg	1st	3-1-06		1 5c 1/2 4c 1 10c 1 5c	1/2 1 5c 1/2 30c 2 30c 2 30c			
C. F. Sedgwick	7	6	1 1 Reg	2nd	3-1-06		2 3 1/2 3c 5 7c 5 5c	7 1/2 1 5c 1 1/2 10c 1 1/2 1 1/2	1/2		

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SOUND WAVES

International Telephone Journal

VOL. XIV | CHICAGO, NOVEMBER, 1907 | No. 6

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CHICAGO, NOVEMBER, 1907.

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PROGRESSIVE MANUFACTURERS.

If there was no better evidence that Independent manufacturers were more aggressive than the Bell manufacturers; that the Independent apparatus was far and away in the lead over the apparatus of its old rivals, we would point to the development in automatics. Only last month the Bell Company abandoned its automatic effort, which had been carefully hidden away in the hills of Allegheny county, Pennsylvania. The experiment was a failure—its engineers were not capable of developing the infant, or else the stingy old octopus wouldn't furnish more funds. Not knowing, we are always guessing. It is probable that our better guess harks back to the apparent evidence that the Bell Company is ambitious to "hog" the long distance business, if it can.

But we were mentioning automatic development. It isn't necesary to hold to that subject, for we are familiar with its progress. To emphasize Independent aggressiveness we are suddenly brought up with the automanual. We are telling something about it in this issue of Sound Waves. From outward evidences here is something new and marvelous. It is presented as "my lady's writing desk" with some push button jiggers arranged in rows like a tiny corn field. Here is the evolution of a switchboard on an improvised lap. The cords are thrown away and the high-seated stools have been dragged off to the basement. You can't "sass" central any more unless you do it before you give her your number, and that is never necessary. You can't single her out and send her bon bons for the imaginary "better treatment." Flanigan's story tells the whole process: "Off ag'in, on ag'in, gone ag'in."

That's the automanual!

It isn't a visionary thing, because Edward E. Clement isn't that sort. It is told that when Clement was younger, he had a sweetheart, and that one certain Valentine's Day he was "short" the necessary sum to satisfy the heart hunger which rested in his bosom. He wanted a fitting outlet for this feeling, but a hand-me-down valentine missed the mark so far that he decided to make one. He wrote a song, set it to music and decorated it with his brushes. It was a busy day, but you will now find that same valentine in his home, suitably framed in the best room, and the girl who received it will play and sing for you the composition that Clement wrote. And when he is not too deeply engrossed in other matters he will join his wife in the chorus.

We tell this to show something of Clement. He has worked faithfully to produce a piece of apparatus that promises to improve telephone conditions. His judgment has enabled him to trust the invention to a manufacturer who has clung to the making of telephones of the better kind.

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Keep your ear to the ground for further develop-

THE PREECE PAPER ON PUPIN COILS.

LOOK FOR THE SHIELD

The paper on the subject of Pupin coils, read recently before the British Association by the eminent and learned English engineer, Sir William Preece, lends new interest to the very important and practical improvement in the operation of long distance telephones. Those who are most familiar with the Pupin achievement will recall that it was based upon an earlier prediction of Oliver Heaviside, who suggested that an advantage would accrue in the working of telephone cables by adding self-inductance to the line. Professor Pupin evolved from Mr. Heaviside's mathematical consideration a wonderfully scientific invention.

Much has been written during the past five years about loading coils for telephone lines. To the ordinary layman the subject involves so much knowledge of higher mathematics and electrical physics that one is apt to become discouraged in trying to read the technical articles that appear from time to time. Very seldom does there appear matter that is within the comprehension of the average telephone manager and it is on this account that we reproduce the Preece paper in this issue.

Loading coils, or Pupin coils, as they are more properly known, are largely employed in this country and are destined to play a great part in the future of long distance telephony. Many very long distance underground circuits are now being constructed. In the east, the famous New York-Philadelphia circuit has already attracted world-wide attention. This circuit is being extended and will eventually reach to other large cities. In the middle west, the Chicago-Milwaukee circuit forms the beginning of an extended system. These long underground lines would be impossible were it not for the loading coils which offset the disastrous effect of capacity. Aerial lines do not profit so greatly by the addition of loading coils, as has been proven by the experience of several of the operating companies. We understand that the coils in many cases have been removed from overhead circuits and that in future little attempt will be made to use them.

Another important field for the use of these coils is in the trunking systems of large cities. Noticeable improvements have been made in the transmission of speech in all of the large cities where coils have been introduced.

Following the reading of this very excellent paper, Sir Oliver Lodge opened the discussion, and said that the advantage of having self-induction in such lines was very great. This was first predicted by Oliver Heaviside, and it was remarkable that his first paper was rejected by the Society of Telegraph Engineers and Electricians. He had clearly shown in his writings that self-induction actually helped by strengthening the higher harmonies which tended to be damped out in transmission. In fact, the high-frequency tones were preserved. In connection with cables, inductance was also advantageous, although there might be a certain amount of reflection from the receiving station. Even if the inductance was lumped together in the center of the cable, they would get improved transmission. In spite of what the author had stated, they should make the waves in a telephone or telegraph line as like true Hertzian waves as possible—that was to say, the electrical and magnetic energy should be equally transmitted. The tendency was to damp down the magnetic energy, and hence by reducing the electric energy they caused it to keep pace with the magnetic energy. For this reason artificial leakage was of service. It was remarkable that Mr. Oliver Heaviside had shown all this in his theoretical writings; thus there was coincidence between scientific prevision and practical accomplishment.

Mr. S. G. Brown also referred to a publication of Mr. Oliver Heaviside's in 1890, which showed the advantage of self-induction placed in lines as isolated blocks. The self-induction should be as equally distributed as possible in order to avoid reflection. The practical solution by Professor Pupin had been sold to a company in the United States for $500,000, together with an annual charge of $50,000. In submarine cables the insertion of blocks of induction seriously interfered with cable-laying, and also increased the reflection. He had endeavored to design a cable with continuous compensation, and the great difficulty was the low permeability of iron. If this could be increased from 150 to 1,000, the problem could be solved by D-shaped copper and iron conductors twisted together.

Prof. S. P. Thompson said that in 1891 he had gone into the subject after reading Oliver Heaviside's work. He found that perfect compensation could not be obtained by anything added to the ends of the cable, although inductive shunts helped transmission. He proposed then to introduce these shunts at intervals along the cable, but found that the cable companies were strongly opposed to the use of self-induction in any form whatever. The fact that the original Atlantic cable was destroyed by the use of a large induction coil, perhaps, was the reason of this. There was also a strong objection to any device which involved a change of cross-section of the cable. The fact remained that inductive shunts had been used with success on telegraph lines, and a telephone cable with compensating inductances at intervals had been laid in Lake Constance. There was still a great deal to do in the perfecting of submarine cables, on which the speed of signalling was only one-tenth that on land lines. Even if the improvements raised the cost three times, it would be worth doing, as the total cost of the cable included the heavy charges for laying.

Sir William Preece, in reply, said it was advisable to tune each mile of cable, and if the four transformers were placed in the middle of a four-mile length the messages were stopped. He did not agree with the other speakers as to the services rendered to telegraphy by Oliver Heaviside.

Fun and business are said to be an explosive compound, but—let's have an explosion once in a while.

THROWING THE DUST.

LOOK FOR THE SHIELD

The Western Electric Company has been operating for six weeks under its new policy of selling everything in the open market. Its plants in Chicago show no evidence of being snowed under with orders. The company has appropriated nearly $100,000 for advertising purposes and it has commenced to spend this immense sum in big chunks. Its telephone catalogue has had a tremendous spread—every operator in the country having been served with it.

So far as can be learned, price cutting has not played an active rôle. Little can be learned of the exact present method by which the W. E. will attempt to coerce the buying of its superannuated goods, but so much is known of Bell practice that we can make reasonably accurate deductions.

We have pointed out in this paper how the Bell Company has emphasized its prestige as a long distance operator. We conclude that it will advance as its most salient argument the long distance qualities of its apparatus. It will attempt to show that Independents cannot cover long distances with their types of apparatus because they were intended primarily for local business.

This sort of argument will "go" in hundreds of com-

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munities. The mere fact that Independents have had all they could do to care for the local business will be worked against them in those places where all the facts are not known.

The sensible thing for Independents to do is to get busy as never before with the construction of long distance lines. The Bell Company is fighting tooth and nail for the supremacy in this work. It is throwing the dust to blind Independents from the advantages to be derived from this feature of the business.

The future of Independent telephony depends upon the long distance connections—the far-reaching telephone. Take this partial advantage away from the Bell Company and it will be deprived of that last essential upon which it is now so expectantly dependent.

A large concourse of Independents met at Creston, Iowa, only a little while ago, the object of which was to discuss ways and means for a copper circuit through the southern portion of the state. In northeastern Nebraska, lines are already under construction to give an outlet for long distance messages. Michigan is designing and building copper circuits and other states are planning to enter into the work.

It is the necessary thing to do. Let the work proceed with vigilance for a period of four months and you will hear the president of the A. T. & T. Co. laying down something new as a change in policy.

There are two ways of acquiring—one is to produce and the other is to rob the producer.

THE ASSOCIATION STAMP.

As a means for raising money, the International Independent Telephone Association adopted a stamp. It has been issued in three denominations, viz: 1 cent, 25 cents and 50 cents. The plan contemplated that the manufacturer of Independent telephone apparatus should purchase these stamps at par from the International Association. The stamps were then to be attached to the apparatus when it was shipped to the purchaser, the cent stamps to be used in the case of a single instrument and the 25 and 50-cent denominations to be used for switchboards on the basis of 1 cent per drop.

The scheme had the approval of the Independent manufacturer, because he felt that it would be an equitable manner to distribute the tax that has been made upon him to support the Association. It would be one way to evade assessments required from time to time to reimburse a depleted exchequer—it would provide working capital for an organization which merits his support.

These stamps have been printed at considerable expense to the Association and they have been ready for sale since March, 1907. We haven't heard very much about them and an analysis of the Asosciation's financial statement doesn't indicate that the manufacturer is working overtime in availing himself of the opportunity to spread this particular "shield."

But the scheme is good and the stamp is good. Operators should insist on the stamp being used. In order that they may become familiar with it, we are reproducing the one designed for the telephone. We are advised that a certain group of twelve manufacturers of Independent telephone apparatus have the full sanction of the Association to use the stamps. Every operator of an Independent telephone system should prevail upon his manufacturer to use the stamps in compliance with the original scheme. There isn't a manufacturer in the business who will not be glad to co-operate in this enterprise if the demand comes from the buyer. It is becoming the fashion to use script nowadays and the International Association has $30,000 worth of these stamps that it would be glad to circulate.

People who complain they are not understood are usually not worth understanding.

TWENTY YEARS HENCE.

"I HAVE called to make a change in your telephone," said the applicant who had climbed the three flights of stairs to the rear door of a suburban flat, one cold December day in 1927.

"What change?" said the tenant; "are you the collector?"

"No, ma'am," replied the caller; "I propose to change your instrument from a ten-party to a four-party selective ringing type. You will remember that the ordinance requires this change to be made."

"Why, really, I didn't know it; is it something recent?"

"Oh, no, not so recent, madam. The ordinance passed the council in November, 1907—the one that Mayor Busse didn't veto, you know."

"Mercy me, you've got the wrong number; we've had the Independent service ever since we've lived here—you must represent the other company. The old wires have never been taken away, and the instrument was never installed at this place, although I do remember that our name appears in the Bell directory, possibly just for a 'filler.' You can come in and satisfy yourself if you don't believe me, but really, I'm in something of a rush myself."

But the weary applicant retired to seek another blind lead.

Don't offer charity to those whom you refuse justice.

BELL FINANCIAL STATEMENTS.

WE are always in a receptive humor to find a joke in the financial apologies that are offered from time to time by our Bell conspirators. All the figures are offered with the blandishment and admonition that they are "conservative" to a degree almost painful. Western Electric's sales for the first nine months of this year, as compared with a like period last year, are "about" 15 per cent less. The "official estimate" for this year will show a decrease of "nearly" $20,000,000 from last year's gross. And this is such a fine example that we give it whole:

> The decrease this year of approximately $20,000,000, or 28 per cent in gross is the second actual decrease and the first of more than $1,000,000 in the gross sales of the company during the last twelve years.

The report goes on to show that the A. T. & T. subsidiaries consumed $46,000,000 of the gross product and that $23,000,000 is made up of "outside" business in which is included all sales not made to the A. T. &

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T. Co. The company has 6,000 employes less than it had a year ago and points out that the slump is due to the absence of new orders for telephone apparatus. As a fitting climax, the company admits that its statement reflects the "rather general abandonment of telephone construction throughout the United States."

So there! You don't see any acknowledgment of competition having had anything to do with it, do you?

And then we find the suave directors of the A. T. & T. Co. pondering over the "partly estimated" table which follows:

	1907.	1906.	Inc.
Balance for dividends.....	$10,960,000	$9,575,000	$1,385,000
Dividends	7,893,000	7,564,000	329,000
Surplus	3,067,000	2,011,000	1,056,000

These figures are "briefly summarized," and on the basis of stock outstanding—$142,514,000—a dividend "equivalent" to 7.69 per cent is available. Compared with last year, this is an improvement of .42 per cent. But, says the apology:

> These figures are, however, it should be remembered, extremely conservative, and, more than that, in estimating the percentage earned on the stock, it is to be taken into account that practically one-half of the payment on the new issue of $21,925,200 put out last June is yet to be made.
>
> The company will, in time, be quite a deal benefited by the abolition of night rate long distance calls, official estimates placing the annual increase in net income at approximately $500,000. Very little of this, however, will accrue to the company during the current year.

If President Vail had not abandoned the chain system of conducting the tremendous ex-trust, how long would the fabric endure? The very bad condition which exists in the manufacturing auxiliary and the struggle the parent company is having with its "conservative" guesses are far from inviting.

Anything but a square deal is a misdeal.

CAPITALIZATION.

One of the liveliest questions of the future, and one that is looming largely even today when we have not quite reached the point where we can grasp it for solution, is where the line is to be drawn in the fight to curb excessive capitalization and excessive profits.

Suppose you build a new telephone system at a cost of say $50,000 and it earns at the start 5 per cent net, or $2,500 a year. That is a fair return upon a fair capitalization. But the population will grow, and with it the earnings of the system. Suppose ten years later the plant is earning $10,000 a year net. That is 20 per cent upon the capital, and 20 per cent is more than a fair return. Should you be allowed to capitalize your system at its new earning capacity? Or is that stock-watering, and must you be pinned down to actual cost of construction? The actual value of your plant, which was $50,000 at the start, has increased with the development of its territory, and if you increase your capital accordingly, you would reduce your rate of dividends by spreading the earnings over more stock. Where is the line to be drawn?

Is it fair to make actual cost the basis, or should it be actual value? And what determines actual value?

President Roosevelt has taken the position that physical valuation is but one of the elements to be considered in fixing the earnings of a corporation. He adds that the effect of such valuation and supervision of securities as is proposed cannot be retroactive. Existing securities must be tested by the laws in existence at the time of their issue. Thus if a telephone company is permitted to over-capitalize, there being no law to prevent it, future laws against over-capitalization cannot apply to its stock.

But suppose a competing system is built under the new laws. It will be limited in its earnings to a fair return upon a fair capitalization. Its rates, therefore, must be much lower than those required to pay dividends upon the watered stock of the older system, and in this way, through competition, the securities in the watered corporation will find their true level, regardless of the unquestioned principle that such reform measures should not be retroactive.

In Nebraska, only recently, this question arose before the state railroad commissioners in a case involving street car fares in Lincoln. The commission fixed a value upon the street railroad properties, and fixed the amount of capital upon which each company will be allowed to pay dividends. The telephone company should find a fair valuation, and limit the profits to a fair dividend return upon that valuation.

Don't be foxy—it's an acknowledgment that you lack real ability.

BE FOR OR BE AGAINST.

Independent telephone endeavor of all kinds should practice with greater diligence the matter of consistency. A little while ago we had a splendid example of the genuine Independent spirit. It occurred in North Lima, Ohio, and the star performers were the Beaver Telephone Company, the Youngstown Telephone Company and the Bell Company. Youngstown was the hero; Beaver the offender and the Bell the villain.

The trouble started when the villain approached the offender and suggested connecting the two systems. The offender forgot his contract with the hero and fell a victim to the villain. The hero found it out and cut off the conspirators and the offender lost his subscribers. Then the offender cut off the villain, sought the hero for reinstatement and got back the business that was lost.

Exeuent villain.

But how infrequently do we hear of such instances. The example of the Youngstown Telephone Company in its treatment of the Beaver Telephone Company should be emulated everywhere, but it isn't. There are hundreds of Independent systems which seek Bell connections, not so much for the small added revenue it brings them, as the thought that they are helping their subscribers to a larger service. There should be only one of two things to consider—get in line with strict Independent policy or get out. The Youngstown example is good.

Always to have enough is to want little.

CONVENTION OF THE INTERNATIONAL INDEPENDENT TELEPHONE ASSOCIATION.

The Executive Committee of the International Independent Telephone Association has wisely chosen mid-winter as the most suitable time for holding the annual convention. It has fixed upon January 21, 22 and 23, 1908, as the date, and the Coliseum, Chicago, as the place for this meeting. The various sessions of the convention will be held in the convention hall of the Coliseum Annex, immediately over the exhibits of the Independent telephone manufacturers and auxiliary supply dealers.

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The layout is ideal. Independent telephone men will have everything that lies near and dear to them under one roof. It will be a grand ensemble of all the apparatus they are asked to buy, combined with a great parliament where they may gather to themselves the best expression of modern telephone practice.

Everything points to the most successful of all Independent telephone conventions. The environment of the coming event will be decidedly different from that of former similar occasions. Only once before was the convention itself subordinated to another attraction. The Electrical Show, while worthy of the splendid eulogy it receives, cannot measure up to the St. Louis World's Fair, and yet the Association's convention that was held in the stuffy parlor of the Inside Inn was a remarkably successful one. Men sat through its deliberations in the sweltering heat of summer, deaf to the appeal of the greatest attraction that was ever conceived.

We recall the event with a great deal of pleasure. There is something truly marvelous about a business that will hold the attraction of its devotees under such circumstances. There is something more than a vindictive spirit to annihilate a dreaded monopoly. We are sometimes of the opinion that the telephone is such an intimate associate in our personal affairs that we pander to its human side. Our love for its service prompts a concerted effort to extend its usefulness, more for the good it will accomplish than for the pecuniary gain it will bestow.

Conventions are always advantageous. They bring men together in good fellowship. The buyer and the salesman, the superintendent and the manufacturer jostle each other and interchange ideas for their mutual betterment.

In January, the manufacturers will occupy 10,000 square feet of space on the ground floor and the operators will occupy 10,000 square feet on the second floor, but the same ticket will admit to both performances. The telephone operator who can't attend this meeting should adopt the Franklin (Indiana) idea—raise the rate!

Don't miss the convention, whatever else you do.

Evil pushed to extreme destroys itself.

PROMOTERS ARE DIFFERENT.

THERE is something about the atmosphere of the A. T. & T. Co. which marks it as being in a class by itself. Those endearing terms with which it is usually associated are not used merely because the Bell Company is bad—they are used because they fit the particular case.

For example, the Bell Company despises the Independent telephone promoter. It gives no thought to its own agents in the field, but continuously vents its spleen upon the promoter of Independent telephone enterprises.

Who is this Independent telephone promoter?

He was born over yonder behind that clump of trees, about twenty-four years ago. He always lived in the community where he acquired his education in the common schools; had his troubles and settled them with due concern for his revered parents and emerged by taking hold of the telephone business. Everybody in the community knows him. He walks the streets of his county seat town with his face straight ahead. He's square with himself and he doesn't believe the average man can hide behind a corkscrew.

In a town of 5,000 population he secured a franchise to operate a telephone system with rates of $24 and $12. If he had had any thought about these rates at all they may not have looked exactly right to him, for the average business house should have more use for the instrument than the residence, and possibly $1 a month was too much for the latter.

But he didn't mind about that. His system took shape; the demand for service continued; the profits went into the plant and time went on. As the service extended, the drag became more and more apparent until it became necessary to have a readjustment.

The Bell Company is making great capital over the rate-raising campaign of Independents. The stingy little sheets it issues in all parts of the country are full of the stuff that the Bell can't understand. Always guilty itself of high-handed methods, it cannot but judge others in like manner. When it seeks to raise its rates, the pompous representative of the law it sends into the community operates from the best room in the local hotel and sends dismay into the hearts of the councilmen. They sniff the tainted atmosphere of the Boston money bags and show fight.

When the hated "Independent telephone promoter" discovers the need of a rate adjustment, he calls across the street to the "city" clerk and asks when the next meeting will be held. He may be interested to the point of asking whether the "boys" are all in town, but he will be there with his troubles. He has settled them before with these fellows and he will do it again. He knows more about the telephone business today than he did when he started and he will know how to explain the telephone situation as it now presents itself to him. He will have very little trouble. He will ask for a square deal from the men he has grown up with and he will get it.

Nature hates monopolies and exceptions.

RAISING THE RATES.

DOWN at Franklin, Indiana, the Franklin Telephone Company is raising its rate. It uses the argument that because of the advance in price of material and the increasing cost of operating each telephone, as the system grows and the service is extended, the rate must be adjusted to meet the new condition.

Like other operating systems, when it commenced to serve subscribers there was no thought of spreading the system out over an entire county. The original plan was to serve possibly 500 subscribers in town. Today the service extends to 3,000 subscribers, covering a wide territory. It costs the company nearly twice as much to serve the subscriber in a large system as against the small system. The service of the large system is more valuable to the user. If there was not good reason for this the subscriber in Chicago would not pay $125 per year for a direct line while the subscriber in Franklin paid only $24. As a fitting appeal to the farmer, the Franklin Company offers these comparative prices:

"When we began operating a telephone plant in Franklin, ten years ago, we paid 57 cents per bushel for wheat, 30 cents per bushel for corn, 25 cents per bushel for oats, $3 to $4 for hogs, $2.50 to $3.50 for cattle, $8 per ton for hay, $1 per cord for wood, $2.60 per ton for coal, 10 cents per pound for butter.

"We now pay 96 cents per bushel for wheat, 65 cents per bushel for corn, 55 cents per bushel for oats, $5 to $6 for hogs, $4.50 to $5.50 for cattle, $16 per ton for hay, $2.25 per cord for wood, $4.25 per ton for coal, 25 cents per pound for butter."

If your rates need "fixing," there is no better time than the present to give the matter attention. Don't let the temporary "money panic" hold you back, for there will be no hard times in the teeth of abundant crops and their attending blessings.

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The Pupin Method of Working Trunk Telephone Lines*

By Sir William Preece, K. C. B., F. R. S.

In 1896 I read a paper before Section A at Liverpool on "Electric Disturbances in Submarine Cables," in which I dealt with the subject of long-distance speaking by telephone. I pointed out that disturbances were due to energy being in the wrong place. An alternating-current wave, set up in a telephone transmitter by a complete sonorous vibration impressed on the diaphragm, flowing for the period *a g*, Figure 1, if its voltage were indicated by *a b* when *positive* and by *d e* when *negative*, would possess in one received wave an energy proportional to the area bounded by *a b c e f g*, if it were wholly ultized, but would only describe the area *a a' d d' g* if the unshaded portion of the figure were proportional to the energy radiated or leaked away, absorbed as a charge or dissipated as heat. The attenuated current thus indicated shows what radiation, leakage, capacity, hysteresis, and resistance may do to absorb energy and deteriorate the clearness and loudness of speech as well as limit the distance to which ordinary speaking is practical. I had previously[1] pointed out that the product of the capacity, K, and the resistance, R, gave a law which approximately indicated the distance to which speech was possible on telephone circuits. It accurately indicates the distance on single-wire submarine cables. In 1890 I read a paper giving the calculations on which the London-Paris telephone line, with its cross-channel cable, was designed and constructed in association with the French engineers. In 1892 it was determined to establish trunk telephone wires between the great commercial centers of Great Britian. All the calculations were based on the K R law. It is quite certain that this law is not absolutely true, for it neglects the factor of self-induction. The K R law is properly of the order K R L, but experience has shown that inductance on short metallic loops is so small that it may be neglected. Mutual inductance between the two capacity wires compensates to some extent the self-induction in each wire. In long underground cables and long aerial wires, however, the influence of inductance becomes evident as the length of lines increase. On the other hand, capacity also increases owing to the variation of the mutual wire-to-wire capacity and the capacity of each wire to earth, which becomes an important factor with concentric cables or with any departure from symmetry. This is why "Hughes's twist" is so valuable and so superior to the "Cross" system so general in America. It not only completely prevents "cross-talk," but it secures a constant capacity with earth. It is known that the effect of this electromagnetic induction is beneficial in one sense, as I pointed out in 1896, and it has been made more beneficial in another sense by Professor Pupin (1899), who has shown how we can reduce the weight of copper used on trunk lines and also how we can extend the distance to which ordinary speech is practical.

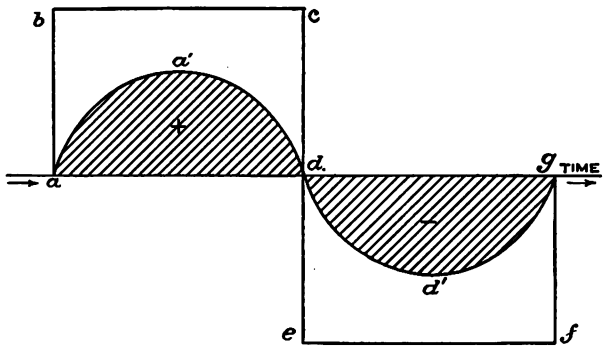

Figure 1.

Pupin's system is not so much the neutralization of the effects of electrostatic capacity by those of electromagnetic inductance as a system of hastening the discharge of pent-up energy without additional loss by breaking it up into many successive steps. In a long submarine cable, discharge is a slow process, and all in one operation. The K R is great and the frequency small. In a "loaded" line it is much more rapid, for it is performed simultaneously in several successive stages of much shorter length and with much less waste or distortion. The factors of energy, E and Q, are pent up by capacity and inductance. Energy is wasted by resistance, leakage, induction, radiation, reflection, and interference. This waste of energy means diminution of amplitude, attenuation, of wave volume, and loss of speech; while electromagnetic induction improperly placed means distortion of wave-form, external disturbances, and loss of articulation. The factors that are involved in the problem of long distance speech are so numerous and so diverse that all attempts to solve them by mathematics, except on very general grounds, have proved fruitless and only approximately true. It has been only by practical experiment that success has been attained. The defect in the mathematical investigation of the problem appears to be the neglect of the prime and principal factor, *energy*, and the assumption that there is in nature something analogous to *negative* energy. Energy, like matter, is always positive and it cannot be annihilated by a negative sign. But mathematical reasoning undoubtedly guided Professor Pupin in going as far as he has. Our president, Professor Silvanus Thompson, took out a patent on December 21, 1891, No. 22,304, where he very carefully considered the subject and very nearly anticipated Pupin.

The establishment of the telephone trunk system in Great Britain in 1896 showed the practical value of the K R law in determining the construction of an aerial system. The weight of copper used in the main trunk lines has been criticised, but the only fault committed was that I did not specify enough. Paris can speak with Liverpool, Manchester, and Hull, but it cannot do so commercially with Glasgow and Edinburgh. London can speak with Aberdeen, Inverness, and Dublin, but not with Cork. Pupin coils have not been applied permanently to the Postoffice trunk lines, but careful experiments have been made to feel the way to do so, and thus, perhaps, extend the range of Paris talks in Great Britain.

I designed a new form of cable and described it in my paper read before Section A in Liverpool in 1896, but no one has as yet ventured to test its merits. A cable designed by Mr. Willoughby Smith of four wires symmetrically twisted on the inside of a guttapercha tube so as to leave an air space, failed telephonically from imperfect symmetry. It was laid across the Irish Channel,

*Paper read before the British Association at Leicester.

[1]On the "Limiting Distance of Speech by Telephone," *Proc.* Royal Society, vol. xlii., Feb. 17, 1887.

from Nevin to Newcastle. Concentric underground gutta-percha-covered cables were laid in 1895 from the General Postoffice to Nine Elms, and failed also from want of symmetry in the capacities between the conductors and earth. A magnificent underground trunk line for telegraphic purposes was commenced between London and Birmingham in 1897, but it was not completed while I was in office (I retired in 1899), and owing to its success it has now been extended, or is being extended, to Manchester, Liverpool, Leeds, and Glasgow in the north, and to Plymouth and Dover in the south.

In 1899 Pupin proposed his coils, and by the enterprise of the American Bell Telephone Company and its allies, great progress has been made in the States in developing the system. Many very valuable experiments have been carried out in Great Britain by the Postoffice and by the National Telephone Company. It speaks well for the technical spirit of the age that splendidly-equipped experimental laboratories have been established in London at the General Postoffice, National Telephone Company's central station, the Eastern Telegraph Company's headquarters, Electra House, and in New York and Boston, in America, by the American Bell Telephone Companies. Very satisfactory advances have been made in Great Britain, and excellent reports of progress have been published by the Institution of Electrical Engineers in London. An admirable paper on "Telephonic Transmission Measurements," by B. S. Cohen and G. M. Shepherd, was read before this institution on May 9 last, which elicited an excellent discussion. I purpose to report the results of a careful inspection I made in New York in April last of the very successful work done in this direction by the New York Telephone Company under the able direction of their chief engineer, Mr. John Carty.

The factors that enter into the problem of trunk-wire working are very numerous and complicated. They are *physical, commercial,* and *personal.* It is, as I have said, not a question of mathematics, but of experiment. What are the factors in long-distance speaking, in addition to the ordinary elements of electrical energy—viz. E. M. F., resistance, capacity inductance, current, and time?

1. Eddy-current heat losses in diaphragms.
2. Hysteresis in coils, cores, and circuits.
3. Change of wave shape due to storage and waste of energy in other forms.
4. Attenuation of waves due to dissipation of energy and its absorption.
5. Loss of the higher notes called "harmonics."
6. Reflection of waves from breaks and alterations in circuits.
7. Reduction of efficiency due to leakage, polarization, radiation, and induction to neighboring bodies.
8. The reactions and interferences of neighboring circuits.
9. The constant change of every condition of circuit elements by switching through to different towns and subscribers.
10. The variable formation of the human mouth, tongue, and teeth of different users.
11. Defects of articulation and want of experience in handling the apparatus by the users.
12. The inefficiency of hearing and interpretation of the listener, and the absence of silence about him.
13. The absence of telephonic education in both speaker and listener.

The remedies are self-education, selection of proper apparatus, symmetry of circuits, the proper distribution of the controlling factors, the restoration of stored-up energy, the alliance and mutual forbearance of users and suppliers. It is clear from this incomplete enumeration of the factors involved that the problem of the reproduction of clear speech at a variable distance is a very complicated one. It has been solved by very patient plodding, by incessant experiment, and by judicious compromise. The K R law as applied to submarine cables is very useful for calculating the speed of working, but inasmuch as trunk telephone circuits are aerial and telephonic currents alternating and very variable in form, self and mutual induction must play an important part in their propagation. It was found, however, by experiment that metallic circuits of copper wire suspended in air and constant in character were actually benefited by self-induction. Hence in designing the trunk system of the Postoffice in 1891, inductance[2] was neglected.

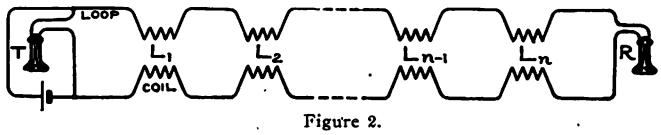

Figure 2.

Ever since Faraday in 1853, while I was assisting him in his experiments, detected two waves in the underground conductors, between London and Liverpool, I have regarded the propagation of intermittent electric currents, whether alternating or direct, in ordinary insulated conductors to be in the form of waves. Cromwell Varley in 1870 made an artificial cable equivalent to one of 12,000 miles long, and showed in evidence 10 distinct currents in it flowing at the same time. I experimented in 1876 at the Silvertown Works on an artificial cable constructed for Mr. Stearn to duplex the Atlantic cable, and obtained evidence of several distinct waves present at the same time with beautiful effects of interference in duplex working. These were waves of energy in its electric form propagated with comparatively slow and variable velocity. Hertzian waves, developed in 1887, are disturbances of the æther of very high frequency, of the order of millions per second, having the velocity of light —viz., 186,000 miles per second. Telephonic oscillations in insulated copper conductors are of the order of hundreds per second, having a variable velocity of the order of 1,000 miles per second. The length of a telephonic wave may be from 1 to 100 miles, but that of a Hertzian one may be from 1 foot to 10,000 feet. Professor Pupin

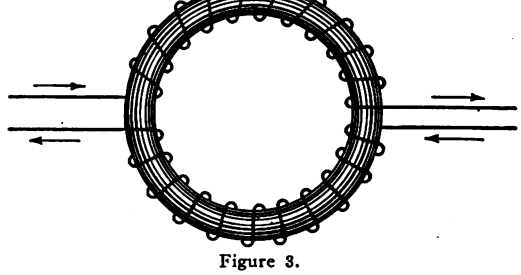
Figure 3.

in 1900 established the existence of these waves in telephonic circuits, and measured their lengths, their form, and their damping. He has reached a practical stage, and has been the means of creating a very great advance in the economic development of long-distance telephony.

Between the voice of the sender at one end and the sensation of hearing at the other end the energy passes through several forms—acoustic, thermic, electric, magnetic, kinetic, and potential. The relations of these changes are very varied and complicated. The elements of energy in its electric form are coulombs, Q, and volts,

[2]Inductance is the coefficient of mutual and self-induction. It is indicated by M or L, and is really a length measured in centimetres.

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E. Currents are coulombs per second. Thus time is an essential element, and the frequency of waves, and, therefore, their length, is a dominant factor in the solution of the question. When electrical energy is transmitted by an insulated metallic circuit like a telephone line we must first consider the capacity, K, resistance, R, and inductance, L, of the circuit. The capacity, K, depends on its form, its length, the dielectric coating, and the surrounding medium. The resistance, R, depends on the metal used, its form and its mass. Copper is universally used for telephonic transmission. The influence of inductance, L, depends on the electromagnetic conditions present in the field, on the form of conductor, and on the direction and rate of change of the currents. The capacity absorbs energy. It holds up a certain portion of the quantity of

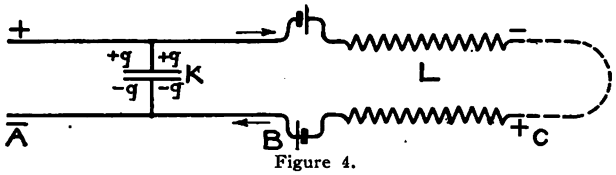

Figure 4.

the charge, tending to attenuate the current but ready to restore it in reaction. The insulating medium gets warm by hysteresis. The resistance which has to be overcome absorbs a portion of the energy, which takes the form of heat and is lost. The Pupin coil stores up another portion of the energy, which, like a spring under pressure, is ready to react on the release of the forced condition and is restored. The frequency within the region of ordinary speech, which may be said to have from 800 to 1,200 sonorous vibrations per second, is not changed, but as distance increases the fine harmonics which give the individual quality or *timbre* of voice disappear, and only the low fundamental tones remain. Thus the length of a circuit allowing a practical talk is limited by the amount of capacity and resistance present. It is increased by the presence of induction when this induction is put in the right place and is of the right character and amount. It is aided by the human ear, which has a magical gift for interpreting into speech what appear to be the merest phantoms of sonorous vibrations.

The diagram, Figure 2, illustrates a complete telephone circuit with its Pupin coils. It is one of a pair of twin copper lines of No. 14 B. & S. gauge, weghing 65 pounds

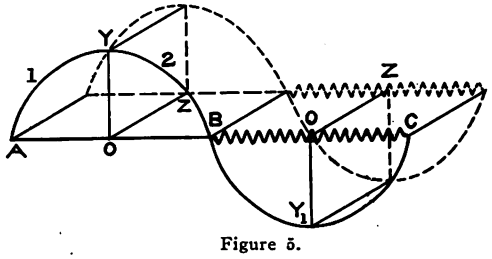

Figure 5.

per mile, twisted about each other and insulated with dry paper, having a resistance of 13.7 ohms and a capacity of 0.065 microfarad per mile. Each coil has a pure soft-iron ring core 3 inches in diameter, made of fine varnished wires to reduce hysteresis to the lowest possible point, and is wound with two wires, which are connected as shown in Figure 3. Mutual induction is thus eliminated and self-induction alone is active. It has an inductance of 0.252 henry. Such an underground cable with 112 pairs of wires, loaded, has been laid between New York and Philadelphia, 90 miles long. Nineteen of these pairs are of No. 16 B. & S. gauge for a short distance. The Pupin coils have been fixed at every 1¼ miles, and it works with a commercial efficiency which Mr. Carty calls a "14-mile talk." The standard of comparison is a mean circuit of 10 miles of No. 19 (1mm) copper wire in the city of New York, which is called the "10-mile talk standard." Each individual section can be shown diagrammatically, as in Figures 4 and 5. The straight lines indicate the two wires of the loop, the wave lines the inserted coil. The capacity of the loop is shown as a condenser, and the E. M. F. of the coil as a battery cell. In the diagram they are shown separate at one instant, but in activity they act together to maintain the flow of energy and retain the form of wave. A, B, C represents *time*. It does not represent length of space or distance. In Figure 5, 1 is the rise of the wave when energy is absorbed and held up; 2 is the decay of the wave when energy is restored. Thus in each section energy is held up as the wave is rising and given out again silghtly impaired by hysteresis when the wave is falling. It is evident, from the clearness of speech, that the sum of all these actions results in a continuous flow of alternations without change of frequency when the limiting distance is not exceeded. When this limit is reached the waves are so attenuated that speech becomes impossible.

On the other hand, it must be pointed out that although capacity is greater than inductance in its influence on the current waves, they neither absorb energy permanently. They only hold it up for a time. Energy can be absorbed or it can change its form, but it cannot be destroyed. This is the doctrine of the conservation of energy. Resistance, radiation and leakage do absorb energy and dissipate it wastefully. Our first object is to prevent waste of energy, and our second object to direct

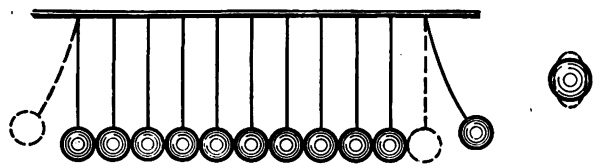
Figure 6.

the pent-up energy into a proper channel to maintain the amplitude and form of the waves. This is what Pupin has done. If we represent the action in a Pupin section in another way by Figure 5, where *A B* represents the metallic loop and *B C* the double coil, *A C* being equal to one complete period of one short fundamental wave, then *O Y* will represent the maximum E. M. F. acting during the period *A B*, and *O* Y_1 that acting in the coil during the same period. *O Z* represents the quantity of electricity, *Q*, flowing during the same period; *Q* is assumed constant. The sections *A B*, *B C* are in tune with each other. A solid figure described by *Q* and *E*, the variable E. M. F., would represent the energy propagated, except the minute losses in the section, which are inherent to the conditions of the circuit. These losses multiplied, eventually absorb all the energy and the limit of speech is reached. The influence of the coils is clearly a time influence. It is a case of tuning. They break up a circuit into a series of sections in which the energy flows in virtually simultaneous steps instead of being prolonged and damped down as it would be in a long submarine cable. The frequency remains unaffected. It is clear that in each wave-length there are four distinctly marked points, *a*, *a'*, *d*, *d'*, where changes of phase affect the distribution of energy and its factors. It is as though *Q* remained for an instant in *A B* and *E* in *B C*. They then change partners with an action that continues the forward movement, but with a slight loss due to waste. I regard the action as somewhat analogous to the transmission of mechanical impulses through a line of billiard balls in in touch with each other. An impulse, Figure 6, is im-

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parted by a driven ball striking the first ball, which is compressed, as shown in the figure at the right; its elasticity by its expansion transmits the impulse to the next ball, with a slight loss of energy, and so on successively through the series until the last ball is impelled away as though no energy had been absorbed. The impulse corresponds to the current, the elasticity to the E. M. F., and the ball to the Pupin section with its capacity (mass), its resistance to change of form and its resilience. This is not unlike the action of air particles against the tympanum of the ear when carrying sonorous vibrations.

The size of coils and the distance apart is mainly a question of experiment. It varies with every circuit; in

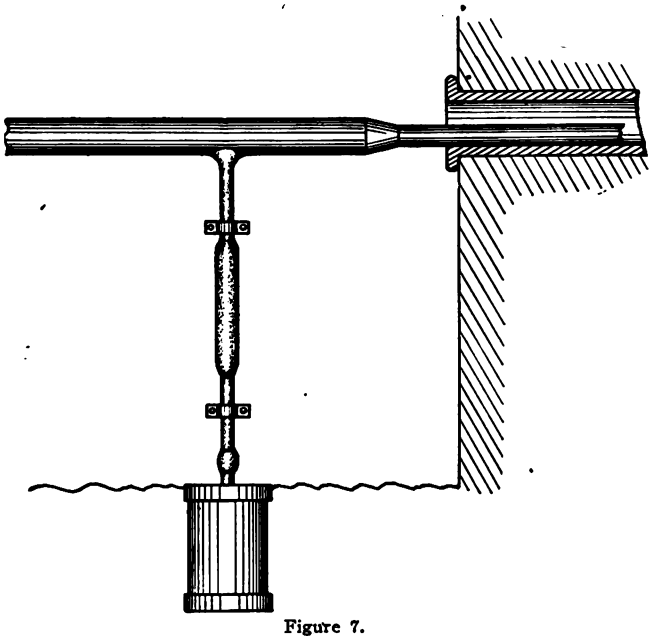

Figure 7.

fact, the solution of the problem is a case of experience and compromise. Sir John Gavey has obtained the best results with coils on long lines at 1⅛ miles and at every two miles on shorter lines; Mr. Carty at every 1¼ miles on long lines, but at every ¾ mile on short lines. The former gets better results with no iron core, the latter prefers fine iron wire as a core. Mr. Gill, engineer-in-chief of the National Telephone Company, places them at every mile, and uses iron cores. These coils are buried in iron cylinders filled with resin oil, and buried as shown in Figure 7. It certainly appears to me that iron must experience some hysteresis, though very minute, and, therefore, causes loss of energy, and though it must enhance the strength of the currents by intensifying the lines of magnetic force, it is of more consequence to reduce the loss of energy and retard the attenuation of the waves. If the coils are improperly placed or imperfectly designed, they do more harm than good. Thus coils which are quite effective at every mile, destroy speech altogether if placed at every four miles.

Among the numerous disturbing influences are those of the instruments at each end. Not only does the receiving apparatus act as a reflector and inductor, but it is a source of secondary radiation, and it causes interference and attenuation. This is very much aggravated by the constant changes of local lines at each end. Hayes has diminished this disturbance by *tapering*, or the gradual reduction of the inductance of the loading coils as the terminal stations are approached. Tapering is distinctly beneficial. Virtually, as all oscillograms show, it becomes a series of small waves of one frequency, probably, according to Kennelly, of about 800—upper G in the treble—which remains constant. There must be a slight loss of energy in each section of precisely similar percentage. The result is the curve of attenuation must be a logarithmic one, and its logarithmic decrement or attenuation constant is obtainable. The smaller this decrement is made the greater the length of the curve and the further speech can be carried. This is the function of the Pupin cell. The relative and continued attenuation of currents is shown by Figure 8, where 1 is an unloaded line, 2 a loaded line without tapering, and 3 the same line loaded and tapered. This is due to Mr. Hayes, of the American Bell Telephone Company, who read an admirable paper at the St. Louis congress in September, 1904.

Through the courtesy of Mr. Gill I am able to exhibit some admirable models which show the behavior of the voltage and currents throughout the whole circuit, with their changes of phase and their variation of amplitude. They are based on calculation, and not on experiment. The white-colored line is the voltage (P. D.) and the red line the currents. They convey an admirable impression of the complicated character of the problem. The wave-length of the fundamental note, by loading, is reduced to one-third, and, of course, the velocity is reduced in the same proportion, but the strength of the received currents is increased from 2.7 to 3.30 milliamperes. All disturbances are filtered out. Speech becomes clearer and louder. The inductance coils are usually of three classes: Heavy, having 0.252 henry; medium, having 0.176 henry, and light, having 0.133 henry.

Loading is not so efficient at present on aerial loops, because it has not been so thoroughly thrashed out as on underground cables, but it is distinctly beneficial, and the solution of the more complicated problem is well in hand. At present the dimensions of the Pupin coils for aerial loops, as well as the spacing, has to be determined experimentally for each circuit. The United States Conference standard cable is, in terms of 10-mile talk:

Weight of copper (pounds)	20
Diameter (mils)	36
Resistance per mile (ohms)	44
Capacity wire to wire (microfarads)	0.06
Capacity wire to earth (microfarads)	0.088
Insulation (megohms)	500
Effective limit (miles)	41.6

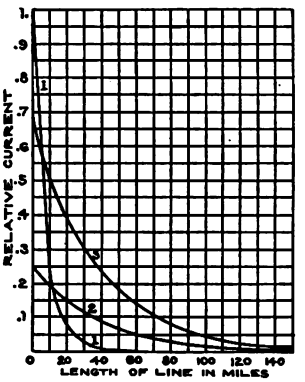

Figure 8.

N. B.—Effective limit does not mean effective commercial conversation. This would approach 60 miles. Our English standard cable is now nearly the same—viz., No. 20 copper wire, of 20 pounds weight per mile, having a diameter of 36 mils, a resistance of 44 ohms per mile, a capacity of 0.056 microfarad, an induction of 0.001 henry, and an insulation of 200 megohms. It would be a great advantage if this cable were made an international telephone standard.

Sir John Gavey experimented on the underground cable which was commenced under my guidance when I was in office in 1897. The cable consists of 76 wires laid up in pairs. Each wire weighs 150 pounds per mile, having a resistance of 5.5 ohms at normal temperature,

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60° F. Each conductor is insulated with paper twisted in pairs, each pair being insulated. There are 38 pairs, arranged symmetrically and insulated in layers. The only insulation is dry paper and air, and the covering is lead. The diameter of the cable is 2½ inches. The capacity is 0.063 microfarad per mile and the insulation about 30 megohms per mile. It is drawn into 3-inch cast iron pipes. It was designed and laid for telegraphic purposes, but with the idea that for long distances metallic circuits might be commercially valuable without mutual interference. In the extension of the system to Glasgow each insulated conductor was lapped with copper foil to act as a screen, a practice that had proved very successful in a submarine cable from Bacton, Norfolk, to Germany. The length of cable from London to Birmingham is 115 miles, and, although unloaded, it was found possible to speak through it commercially. The use of loaded lines is growing rapidly. The equivalent range of speech has been increased in one case from 66 to 176 miles. This is an instance of an underground cable. Although in Germany they have found the ratio to be ¼, in America it is thought that 1-3 is the outside commercial limit, and in Great Britain we find the range of a loaded line is 2.4 times that of an unloaded one. I have been able to test the relative efficiency of unloaded and loaded cables of what should be called the international standard pattern. I found that 8.3 miles on the former was equivalent to 20 miles on the other. This was not 2.4 to 1. It was not a test of possible distance, but of relative efficiency.

The result is not equally beneficial in aerial wires, for the conditions are more variable, especially in insulation and in atmospheric electrical troubles in countries like South Africa. Anyway, loaded lines will enable us to use less copper for long trunk wires—something of considerable advantage in these days of inflated prices in copper, and in countries like South Africa, where one long stretch of 1,010 miles has to bring, say, Johannesburg to Cape Town. The application of this principle to submarine cables has not yet reached a practical stage. Our president will have something to say on this. Prof. Pupin has the matter in hand on the other side of the Atlantic. The reaction coils must, however, be placed at such small distances apart that the manufacture of such a cable seems difficult and its maintenance problematic.

It is important to observe that in telephone circuits the frequency is not affected. If it were, speech would be impossible. It is attenuation that limits the distance. It is well known that in practice the higher notes, or harmonics, superimposed on the fundamental notes, *which give the quality of sound,* are the first to disappear, and that the last to remain are the low fundamental notes decreased in volume. The ear is so marvelously constructed that it adapts itself to all the perplexities of existence, and it can interpret speech amid the turmoil of considerable external disturbances. We know little of its internal structure, and less of the physical actions that render it such an exquisite analyzer of sonorous vibrations. It has been assumed that the velocity of propagation of the current waves through the circuit is such that the action in each Pupin section is virtually simultaneous, and the action continues along the line. If we admitted geometrical length, the physical explanation would be more complicated. A slower velocity in loaded cables means an increase to the limiting distance of speech. Hence the reason why the limit is reached so rapidly in cables and underground wires. On overground lines the distance to which it is possible to speak is limited only by the weight of copper. Two thousand miles is easily attained without coils. The question of loaded underground cables against open unloaded aerial circuits is purely a financial question. The dominant factor is the price of copper. But the cost of maintenance, the reliability of working, and the freedom from troubles must weigh considerably in the balance. Every case must be decided on its own merits.

I cannot too often repeat the warning that telephone troubles arise principally from ignorance of the system of working, and that the principal source of trouble arises with the subscriber himself. The American knows this, and does all he can to support the company which supplies him. The Englishman growls and writes to the press and thinks he has done a clever thing. Some wiseacre has even proposed to establish a Users' Mutual Protection Society to maintain the present unfortunate antagonistic system between supplier and user. The best protectors are personal self-reliance and self-education.

Work Progressing at Norfolk.

Editor SOUND WAVES: In addition to the building of the Independent telephone plant at Norfolk, Nebraska, there is a great activity in the telephone field in the northeastern part of the state. Norfolk's plant is well under way, having all the underground work completed, pole lines set, slugging and guying done. All the messenger strand will be strung by November 15. This will be an automatic, all-cable plant with the down town district underground. A two-story pressed brick building is being erected and service will be given not later than January 15. The company will be known as the Norfolk Long-Distance Company. It now has a long-distance line built to Hoskins, at which point it expects to make connections with the New State Company of Sioux City, the latter company at present closing up a gap from Wakefield to Hoskins. When this line is completed Norfolk will have long-distance connections as far north as Minneapolis and St. Paul. This connection will also furnish good copper service via Sioux City to Council Bluffs, South Omaha and Omaha and other points east. The Norfolk Company is also building long-distance lines in Madison county which will give a southern outlet through Columbus and Fremont and these lines will be connected with the long-distance lines of the New State Company which will be built from Omaha west along the Union Pacific railroad, taking in the territory covered by Fremont, Columbus, Central City, Grand Island and Kearney. When these proposed lines are completed, the eastern half of Nebraska will be well taken care of by copper connection on first-class standard construction. In the immediate territory tributary to Norfolk, there is now under way considerable building which will be completed or at least in service before the first of the year.

Hoskins has just installed a new plant which will start out with about 200 subscribers. There has also been a new company organized at Madison, which is now building a first-class up-to-date exchange in the town of Madison where it will compete for business with the Bell sub-license company now operating there. The new company has some 200 farmer line connections at present and most all of these subscribers are stock holders, which puts them in position to almost demand the support of the local people at Madison and the exchange will open with something in the neighborhood of 400 subscribers. There is a long-distance line being constructed at present between Norfolk and Battle Creek and this line will be continued along the C. & N. W. Ry. at least to Tilden and in the spring will go on west along the C. & N. W. Ry. in order to give the Independent plants in that territory an outlet. All construction that is being put up is standard in every particular and will be capable of giving a first-class and efficient service.—W. S. S.

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History of the Automatic Telephone

By Arthur Bessey Smith

IN the attempt to get rid of the difficulties incident to the use of the then imperfect magnets, T. A. Connolly brought out a switch which contained only rectilinear conductors arranged in two planes. The patent was applied for April 10, 1883, and was granted with the number 295,356. Figure 3 shows the plan of arrangement. It is novel in that it employed power drive to make the connections, also that the current impulses were made

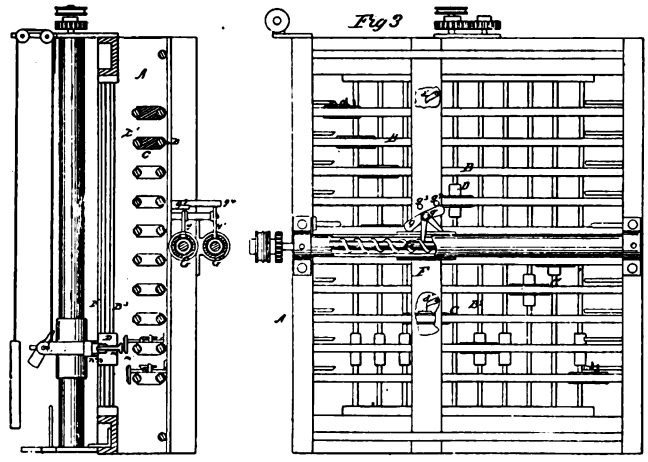

Figure 3.

and broken at central and the movement of the dial was controlled by the switch at central. *B, B,* etc., are horizontal bars which carry each a sliding contact block, *D*. There is one pair of horizontal bars for each line, and the sliding block on them is the device by means of which the line hunts up another line for connection. Behind the bars, *B, B,* etc., are other bars, *B2, B3,* in pairs, each pair being connected with one outgoing line. This gives each subscriber's line a pair of horizontal bars with which to connect to other lines, and a pair of vertical bars for receiving calls. The vertical bars carry contact blocks also, which are kept always in motion, sliding up and down on the bars by a power driven sweep as indicated at the left in Figure 3. Each contact block on the horizontal bars has a cord or flat tape attached to it running to the right, over a pulley to a weight. This tends to move the block to the right, as shown in the simplified sketch, Figure 4. Attached to the shaft which carries the pulley is a notched wheel, *W,* a stud on the back of the armature of magnet M_1, fitting into one of the notches, preventing the rotation of the wheel and keeping the block in its home position at the extreme left. A contact wheel, *C,* is also mounted on the shaft, it having as many contact bars as there are notches in the wheel, *W.* The brush, B^1, carries the subscriber's line to the wheel, *C,* and the other brush, *B,* is arranged to be in contact whenever a notch is opposite the stud on the armature of M_1. Sw_1 is an auxiliary switch connected with the block.

The subscriber's line goes from the magnet, M_1, to the dial at the substation. Mounted on a shaft is an arm, *A,* which carries on its under side a spring, *S,* insulated from the arm. The line comes to this spring, which tends to make contact with *K*. The pin, *P,* carried by another arm on the same shaft, but insulated from it, is connected to the telephone set, *T,* which has apparatus for talking and ringing. The contact, *K,* is attached electrically to the arm, *A,* which goes to the marget, M_2, and thence through a switch to battery and ground. In the normal condition, arm *A* is at zero, with *P* resting against *S,* giving us a complete circuit from *T* to central. To call No. 3 on the board, the arm, *A,* is rotated till it is opposite that number on the dial. This closes the contact between *S* and *P*. The switch, Sw_1, is now closed, allowing current from *Ba* to flow through magnet M_2, contact *K,* spring *S,* line, magnet M_1, brush B^1, wheel *C,* brush *B,* switch Sw_1, to ground. This energizes M_1, withdrawing the stud from the notch in the wheel, *W*. This allows the weight to pull the contact block along its rods. The stud is prevented from engaging the notches as they pass, owing to the contact of brush *B,* which occurs just when the notch comes opposite the stud. These impulses of current also operate the dial magnet, M_2, causing it to let the arm carrying pin *P* advance one step for each pulsation of current. When *P* reaches *S,* it presses the latter away from its contact, *K,* breaking the circuit, and allowing magnet, M_1, to catch and hold the wheel, W.

The contact block is now opposite the vertical bar of the line desired, and in a short interval of time the block which is moving up and down on that vertical bar will engage the block on the horizontal bar, operating switch, Sw_1, cutting off the ground so that both lines are connected through. The ringing current was intended to be so weak or of such a nature as not to affect the magnet, M_1.

When through talking, the calling subscriber had to

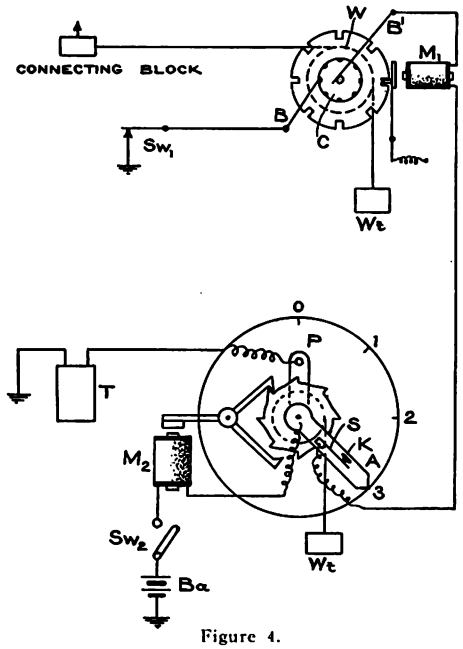

Figure 4.

operate his dial in such a manner as to move his horizontal contact block on till it reached the end of its run. There a mechanical device was automatically thrown into play, which allowed the block to be caught by the sweep, *F,* (Figure 3), on its next trip, and be carried by it to the extreme left, where it was held normally.

The prominent features of this system may be summarized as follows:

1. The line terminals are straight bars, parallel, carrying sliding blocks for making contact.

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2. The terminal bars were divided into two groups, those for orignatng calls, all in one plane, and those for receiving calls, which were in another plane, parallel to the first, but with the bars at right angles to the other bars.

3. Power drive was used to move the blocks in making a connection.

4. The movement of the block by the power drive made the interruptions in the current which moved the dial at the substation, and the dial determined the point

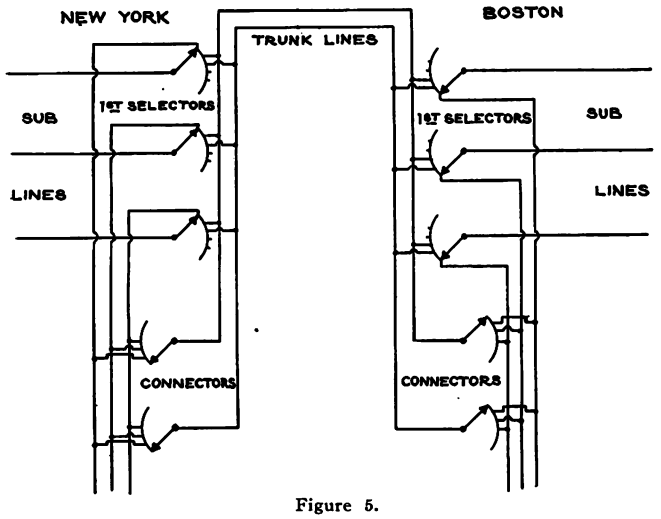

Figure 5.

at which these current impulses should cease and stop the movement of the block.

5. In releasing, the subscriber had to step his switch on to the end of its movement, but the release from that point was automatic and complete, carrying the block back to its zero position in a positive manner.

6. There were many mechanical devices employed to do electrical switching in preference to using relays.

J. G. SMITH'S AUTOMATIC TRUNK SELECTION FOR TELEGRAPH LINES.

November 2, 1889, there was application made for a patent on an automatic switching system for telegraph lines. The patent was later allowed under the number 481,247. This invention, though not intended for telephone use, embodies some principles which have since been improved and applied to automatic telephone switching. These principles are so important and widely used that it is well worth our time to take a brief look at the system.

The inventor was trying to cheapen the cost of giving private wire service to brokers and others who desired telegraph connection from their offices in one city to those in another city. He observed that if there were as many wires run between two cities as there were circuits leased, most of them would be in use but a comparatively short portion of the day. His idea was to provide only enough trunk lines to serve the maximum number that would be in use at any one time. Any telegraph subscriber should have access to any of the trunks, and the switching done automatically. To prevent two subscribers from getting in on the same trunk, he invented a device of very ingenious nature for hunting for the first trunk which was not busy.

The general plan is best shown in Figure 5. The subscriber lines terminated in switches, which we may call "first selectors" since they make the first selection, the picking out of a non-busy trunk. There was one first selector for each line. The trunk lines were multiplied to the bank of contacts on each first selector, so that each line could connect with each trunk. Each trunk line terminated in a switch best known as a "connector," since it makes the final connection with the line desired. There was a connector at each end of each trunk, so that the line could be used in either direction. All the subscriber lines were multiplied to the banks of all the connectors. A detailed diagram taken from the patent specifications is shown in Figure 6. Two first selectors are shown at *1* and *1a* and one connector at the right. The last is to receive calls from the other city, which is wired in a very similar manner. *Main line* refers to the trunk. Both the first selector and the connector are seen to consist of a circular bank of contacts which form a complete cylinder. There is a set of four contacts for each trunk line and a set of two contacts for the "home point" of the subscriber line to which the switch belongs. Through the center of all the selectors runs a shaft which is kept in rotation by a small motor or other source of power. Rigidly attached to the shaft is a disk, *5*, in each selector. The magnet, *7*, together with the wiper arms, *11*, *12*, and *13*, and the commutator are mounted on a sleeve which fits the shaft loosely. The wipers are fixed on an arm or lever which carries a stud, *10*, and an iron armature which is under the influence of the clutch magnet, *7*. There is a circle of holes in the disk attached to the shaft and the stud on the arm is able to fit into any of them. It is prevented normally from doing so by the attraction of the magnet, which holds the wipers in their home position. If the magnet be released, a spring will pull the arm over, carrying the wipers away from their contact points and allowing the stud to slip into one of the holes in the disk. This clutch-like acton causes the whole arrangement, magnet, arm, wipers, etc., to revolve with the shaft till an idle trunk has been found. The clutch magnet will then be energized, pulling the stud out of the hole and stopping the wipers. The same action brings the latter into contact with the springs of the trunk line selected.

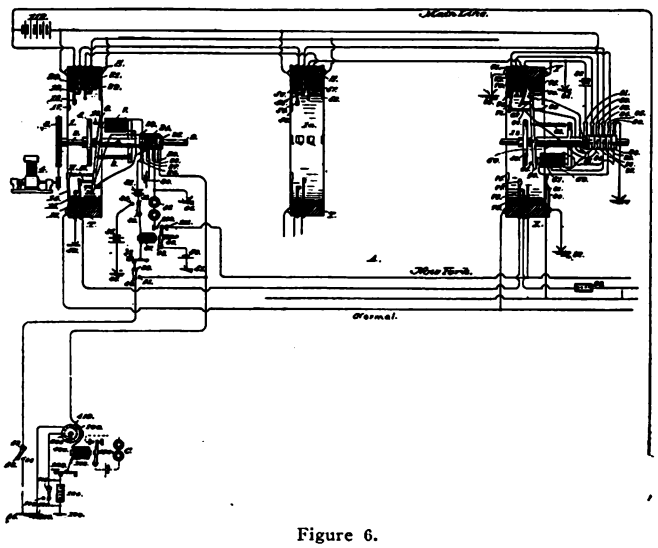

Figure 6.

Having explained the mechanism, the circuits will be more easily understood by reference to Figure 7. This is merely a schematic arrangement of the circuits with which we wish to deal. Many details have been omitted for the sake of greater clearness in the actions which interest us. The bank of contacts has been shown as if on a plane: *14* is the home point for the subscriber who uses this selector, and is connected to the "normal line" or line over which calls may be *received*; *17* is the contact to which is connected the trunk line shown, other lines being

connected to the like springs to the right; *22* is the busy contact and is normally connected to ground through *20*. The spring, *22*, is multiplied to all like sprngs in all the selectors which have access to this set of trunks. The ground connection is looped from *20* through all the similar contacts in all the other selectors in the group. The two wipers, *11* and *13*, are under the control of the clutch magnet, *7*, so that when the latter is energized the wipers are pressed upward, bringing *11* into contact with *14*. When the clutch magnet is de-energized the lever moves over, carrying the wipers down, so that the lower point of *13* is in a position to wipe over *22* and all similar springs; *26* is an "off normal" switch, which is a representation of a portion of the duty of the commutator shown in the preceding figure. Its two contacts are touching only as long as the wipers are in their normal position, being broken as soon as the clutch has moved them away.

Attached to the wiper, *11*, is the line, L_2, which leads to the subscribers' instruments. It passes through a dial magnet, *102*, and through resistance to ground. This dial magnet is arranged to move a wiper, *425*, by a step-by-step movement. There is a circle of holes under the wiper and a plug, *430*, which may be inserted into any of the holes. This plug carries ground, and is high enough to touch the wiper.

At central the clutch magnet is kept normally energized by a small battery, *30*, which is closed through the off normal switch, *26*. A relatively strong battery, *31*, is in a second line L_1, leading to the substation to a switch, *42*, normally open.

To make a call the plug, *430*, is placed in the hole corresponding to the number of the line desired at the distant city. Then the switch, *42*, is closed. This allows the battery, *31*, to furnish current which weakens the clutch magnet, *7*, to such an extent as to cause it to let go. This carries the two wipers down and lets the stud slip into one of the holes in the disk. Since the disk is constantly revolving, it now carries the wipers with it. The first motion opens the off normal switch, *26*, thus throwing the battery, *30*, out of circuit. It will be seen that the continued rotation of the wipers is dependent on keeping the clutch magnet dead. Since the wiper, *13*, is the terminal of the battery and magnet, if it can get connection with ground, the circuit will be completed and the magnet energized. In this simple way the wiper, *13*, constitutes a "feeler," which touches spring, *22*, and all similar springs on its way around the circle, hunting for a ground. Let us suppose that the first trunk is *not* busy, so that its busy spring, *22*, will have ground. As soon as wiper, *13*, touches *22*, the clutch magnet will be energized and release the clutch, stopping the wipers. The same action pushes the wipers up, bringing *11* into contact with *17* and *13* into contact with *20*. In touching *20* it is pushed away from its normal contact, *21*, thereby taking ground off *22* and the other springs in other selectors corresponding thereto. The circuit for *13* is now completed to ground through *20*, holding the clutch magnet, *7*, energized. If, now, some other subscriber sends his selector around hunting for an idle trunk, the busy wiper will find no ground on *22*, and its clutch will therefore not be pulled out. So the other wiper will be carried by this particular trunk to test and find the next one.

We are now secure in the possession of our trunk to Boston. In the connector in which our trunk terminates there are the same general features of cylindrical bank of contacts, power driven shaft, wipers, clutch magnet, etc. The clutch magnet, *CM*, has two windings. One of them, *62*, is normally connected to ground on one side and through the off normal switch, *91*, to battery and ground on the other. In this way it is kept energized. The three wipers, *66*, *69*, and *68*, are thus held up, so that *66* presses against spring *71*. It is not in electrical contact with it. The trunk line comes through winding *61* of the clutch magnet and goes to ground through spring *71* and its contact, *70*. When the wiper at New York came into contact with the trunk line at its terminal, *17*, battery *112* caused current to flow as follows: From ground at Boston through winding *61* of the magnet, over the line to New York, through *112*, through wiper *11*, over the subscriber's line, through dial magnet *102*, and through resistance to ground. This flow of current in winding *61* of the clutch magnet at Boston neutralizes the effect of the current in *62* with the result that the magnet releases and slips the clutch into action. This same motion moves the wipers *66*, *68*, and *69* down. Spring *71* now touches *72* instead of ground. The main line circuit is now extended from the line through winding *61*, to springs *71* and *72*, ending in wiper *69*. As soon as the wipers begin to move under the rotary action of the shaft, the off normal switch, *91*, breaks contact, putting battery *97* out of use.

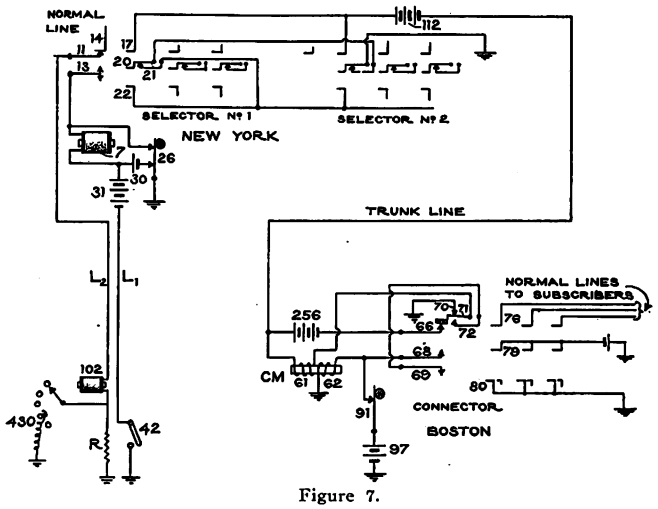

Figure 7.

Wiper *69* being down, is in a position to wipe over spring *80* and all similar ones. They are connected to ground. As the wipers proceed, this will give rise to a series of ground connections, each of which will energize the dial magnet, *102*, and step the wiper around one notch for each line passed. The resistance, *R*, was designed to limit the flow of current to such an extent that it would not affect the clutch magnet, *CM*, at Boston. But when the wiper on the dial reaches the plug, *430*, the resistance will be cut out and winding *61* of the clutch magnet, *CM*, energized. This stops the wipers at the desired line in Boston, *68* touching *79* to lock the magnet in position, while *66* touches *76* and completes the circuit to the called station. As the selector and the connector are held in position by auxiliary circuits, the main line may now be opened or closed and regular telegraphic communication carried on.

It is not my purpose to make a critical study of this invention, for we are not interested in it as a telegraphic device. But as regards the automatic switching, the following points are to be noted as of great interest:

1. A Trunking System.—The attempts at automatic switching of telephone lines which we have just studied, tried to get the maximum ratio of connections, i. e., fifty per cent. In other words, they thought it necessary to provide for the inter-connection of all the subscribers at once. This device of J. G. Smith would have given the

early inventors the right idea of automatic switching, that of only enough trunking apparatus to take care of the business. It would have required some changes to have adapted the system to telephone use.

2. The Circular Bank.—In this the system was along the most advanced lines of work of today. Numerous attempts have been made to get up a system of automatic switching employing rectilinear movements in a plane, but they have failed.

3. Power Drive.—It seems that the early difficulties of getting accurate mechanical construction in the wipers and banks of contacts were very great and gave rise to considerable friction. To overcome this and move the wipers with certainty was too much for the magnets of that day. Since then the friction of moving parts has been reduced in a remarkable degree by correct mechanical construction, and the power of magnets increased also. But there are still some who contend that power drive is the best for automatic switching.

4. Central Energy for Selecting.—As far as I know, this is the first attempt at applying strictly central battery to do all the switching. It was not common battery, for each line required its own battery.

5. Automatic Selection of Non-Busy Trunk.—This was accomplished by allowing the feeling wiper to hunt for a certain electrical condition in the contacts which it touched. This broad principle is applicable in a great variety of ways, and is very valuable.

6. Control of Dial from Central.—As we have seen, this idea is not entirely new, as the same general idea was used by Connolly & McTighe in the last board described.

Though the system possesses grave defects, it is a pity that some one did not take hold of it and remodel it into a good automatic telephone switchboard. In some points it was ahead of its time.

EARLY HISTORY OF THE STROWGERS.

Almon B. Strowger and William Dennison Strowger were brothers, born and reared in good old New York state. Both attended the common schools and the university and obtained excellent educations. A. B. Strowger was especially inclined to scholarly pursuits. But the excitement of the Civil war broke in on his studies, as it did with many others, and he served through the war as a bugler. After the war was over, he completed his education and entered the teaching profession. He had a special liking for mathematics.

W. D. Strowger became a nurseryman at Oswego, N. Y. He was much inclined to inventions, in fact, inventing seemed to be in the family. He had invented various subsoilers, ditchers, a band saw, and other things. His son, Walter S., was born at Oswego, March 3, 1863. After attending the public schools and the high school, he was sent to college at Fulton, Ill., where he took a scientific course.

On one of his vacations when he was home with his father, the two had a long talk as to what they would do when the son graduated. All along the father and son had been associated in inventive work, but this time a retrospective feeling led the father to recite his past work, his experiences, his successes and failures, and at length to enlarge upon the possibilities of the future. They talked over many things upon which they could work together. The father even suggested air ships, and finally the possibility of an automatic telephone switching device. He had no plans, but with the usual faith of inventors though it could be done. This was about 1880.

On account of ill health, Walter S. Strowger was obliged to go west for employment in the open air. In 1883 he went on a ranch in Kansas, where he worked for three years. He settled on a farm near Eldorado and ran it for two years, after which he moved to Eldorado.

After teaching for some years, Almon B. Strowger moved to Topeka, Kan., where he engaged in undertaking. Later he removed to Kansas City, Mo. He was of a retiring nature, nervous and sensitive. In using the telephone he often suffered from the mistakes of the operators. It is not to be supposed that girls were any more careful then than now. These mistakes, delays, curt answers, negligence and interruptions annoyed him beyond measure. In his vexation, he vowed that he would do away with them. This led to his inventing the system which bears his name.

How many of the advances of life have come through the apparent thwarting of our desires! A man was once annoyed by the crying of his child. On asking the reason for the crying, his wife replied that it was a pin sticking the baby. The man made some remark about her ability to insert the pin in such a manner that it would not cause pain, and received the reply that it was impossible, for the pins *would* work loose in spite of the best pinning. His spirit was roused by the situation and he declared that he could make a pin which would not stick anyone. And he did, for he gave to the world the first safety pin.

Another man, reduced to such poverty that his wife had to take in sewing, sat one day in their poor attic watching her nimble fingers as they deftly passed the needle in and out through the goods. The thought of the purely mechanical nature of the operation struck him forcibly, and he wondered if a machine could be made to do the work. But he did not stop with the mere wonder, for he went to work with such energy that he succeeded in finishing a machine which not only would sew, but did it faster and better than could be done by hand.

If the baby had not cried at the right time, the safety pin might not have been invented as it was. If Elias Howe had been in comfortable circumstances, he might not have been led to study sewing and bring out the sewing machine. If the telephone operators had been quick and sure and polite, or if Mr. Strowger had been one of those good natured men whom nothing angers, he probably would never have turned his attention to the automatic telephone.

A. B. Strowger's determination to do away with manual operators started him to active work and his ideas took tangible form in an application for patent on his system, which he filed March 12, 1889. Shortly after this, his nephew, Walter, came to visit him at Kansas City, Mo. He told Walter of his trouble with the operators and that he was then working on the design of an automatic switch to do away with them. To illustrate his idea he walked into the bedroom, picked up a collar box, and with it he showed how he proposed to arrange the terminals in rows on the inner surface of a cylinder. He explained that some sort of an arm would be arranged to swing on a shaft and be able to come into contact with any of the terminal wires. After talking over the matter for some time, he asked Walter to work with him in developing the invention. The nephew was about twenty-six years old at this time, full of energy and willing to work. He readily consented, and from that time on he lived at his uncle's house.

The first thing to be done was to begin the construction of a model according to the best ideas which they had at that time. They expected that difficulties would develop, and that the only way to find them was by actual construction. Realizing that the switch would doubtless call for exact construction, they went to Wichita and hired

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a jeweler and helper at $5.00 each per day to make the first model.

Of the trials of these early days it is difficult for us to get an adequate conception. It would be suposed that above all other men jewelers would be able to put up exact and true construction, to make all the parts so that they would operate like clockwork, with ease and certainty. It is very likely that they could have done so, but they did not. They had no faith in the project, their heart was not in their work. One of the early writers has said that "Without faith it is imposible to please God," and we may add that without faith it is impossible to do any great and lasting work. But with faith in the outcome, with his heart in the work, a man can do almost the impossible.

Although Almon B. Strowger was the inventive genius who devised the circuits and mechanical parts, a great part of the responsibility for getting those ideas reproduced in wood and metal fell on his nephew, Walter. Many a night the latter worked till midnight planning the work for the next day, so that the workmen could proceed along the lines laid down by the inventor. It seemed almost impossible to get the workmen to get the idea or to construct the machine with sufficient accuracy. A. B. Strowger's retiring nature shrank from the struggle and often gave vent to the words, "We can't get them to do it!" But what the older man lacked in courage the nephew made up, and threw his whole energy into the task. Walter's mother also stood by him and always encouraged him to go ahead and make it a success.

There were those among the friends of both men who enjoyed throwing cold water on the whole business. One of them told Walter Strowger that he had better go and hire out to a farmer, as he would make a better success and more money. N. F. Frazier, a man of considerable means, living in Eldorado, proved himself a great friend during these times. He loaned them money and encouraged them in their work. During the first two years of the development Walter S. Strowger sold everything that he had in the way of property, sometimes getting only a quarter of the value of it. Upon this money and that generously advanced by Mr. Frazier the first two years' work was done.

Joseph Harris was at that time a traveling clothing salesman. Having a brother-in-law in Eldorado, he used occasionally to stop there. It was known locally that W. S. Strowger was working on an automatic telephone system and Mr. Harris heard of it.

Thinking this would make a good investment, Mr. Harris approached W. S. Strowger and offered to make a contract for the idea. Mr. Strowger did not act on the offer, but told Mr. Harris to wait till the model was completed.

In working out the circuits for operating the switch which he had invented, A. B. Strowger attacked the problem from an entirely new point of view, which it is well for us to understand clearly. Preceding attempts at the construction of automatic systems had clung to the single wire idea, trying to operate all sorts of mechanisms and electrical apparatus over one wire with ground return. Mr. Strowger proposed in his first machine to use as many wires as he needed and thus get it to operating. Then he would try to reduce the number of wires as rapidly as possible, not attempting to sacrifice simplicity and certainty for a small number of wires.

Montana Independent Telephone Company

By Thaddeus S. Lane

FEW Independent telephone companies have begun operation under as favorable circumstances as the Montana Independent Telephone Company at Butte, Mont., which has just inaugurated an automatic system of the Automatic Electric Company's manufacture.

Thaddeus S. Lane.

For a good many years the Bell Telephone Company have had things their own way in Butte, as there was no competition. Butte, as is well known, is the center of a powerful labor element, and early last spring the operators employed there by the Bell Telephone Company formed a union and made up a wage scale under which the minimum wages paid to ordinary day operators was fifty-six dollars per month. After negotiations the Bell Telephone Company accepted this scale and the operators began working under it. The Bell Company in that section is the Rocky Mountain Bell Telephone Company, and at that time the company was having difficulties with its union linemen in Utah. Things came to a crisis and the operators of the company in Butte were called out by the union early in July in sympathy with the striking linemen in Utah. This strike occurred early in July, and for two and one-half months Butte was without any telephone service whatever.

On September 16th, the Montana Independent Telephone Company opened its automatic exchange for service in Butte, and at the present writing has more than 2,500 telephones in operation and a large number are being cut over daily. Every bit of the construction work, inside and outside, has been done by union labor, and the Montana Independent Telephone Company believes it has dealt fairly and squarely with the labor unions and has their hearty support. The present outlook is that the Bell Telephone Company will never regain its previous standing in Butte. It has lost its best operators, who have entered other lines of work, many of whom have gone to the Montana Telephone Company as toll line operators, etc., and the Bell Company appears to be in a state of permanent disability in Butte. What the Montana Independent Telephone Company has done in Butte will also be done in Anaconda, Helena, Missoula and Great Falls and a number of smaller cities in the state.

The Montana Independent Telephone Company was organized in June, 1906, and the officers of the company are: H. A. Gallwey, president; P. B. Moss, vice-president; C. J. Kelly, secretary and treasurer, and Thaddeus S. Lane, managing director. The board of directors con-

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sist of the following gentlemen: A. J. Davis, president First National bank, Butte, Mont.; W. G. Conrad, president Conrad Banking Company, Great Falls, Mont.; P. B. Moss, president First National bank, Billings, Mont.; C. J. Kelly, manager Hennessy Mercantile Company, Butte, Mont.; Elmer B. Jones, managing director Utah Independent Telephone Cmpany, Salt Lake City, Utah; Thomas Couch, Jr., Great Falls, Mont.; Thaddeus S. Lane, managing director, Butte, Mont.; C. F. Kelly, secretary Anaconda Copper Mining Company, Butte, Mont.; J. T. O'Brien, of Fariss, O'Brien & Rowe, Butte, Mont.; H. B. Brown, manager securities department, Butte, Mont.; F. H. Clinton, superintendent Electric Light & Street Railway Company, Anaconda, Mont.; L. O. Evans, attorney, Butte, Mont.; H. A. Gallwey, manager Parrot Mining Company, Butte, Mont.

The company has a stock issue of $1,500,000, and an authorized 6 per cent bond issue of a like amount. It owns liberal franchises in all the cities of importance in Montana and intends to develop them as fast as possible.

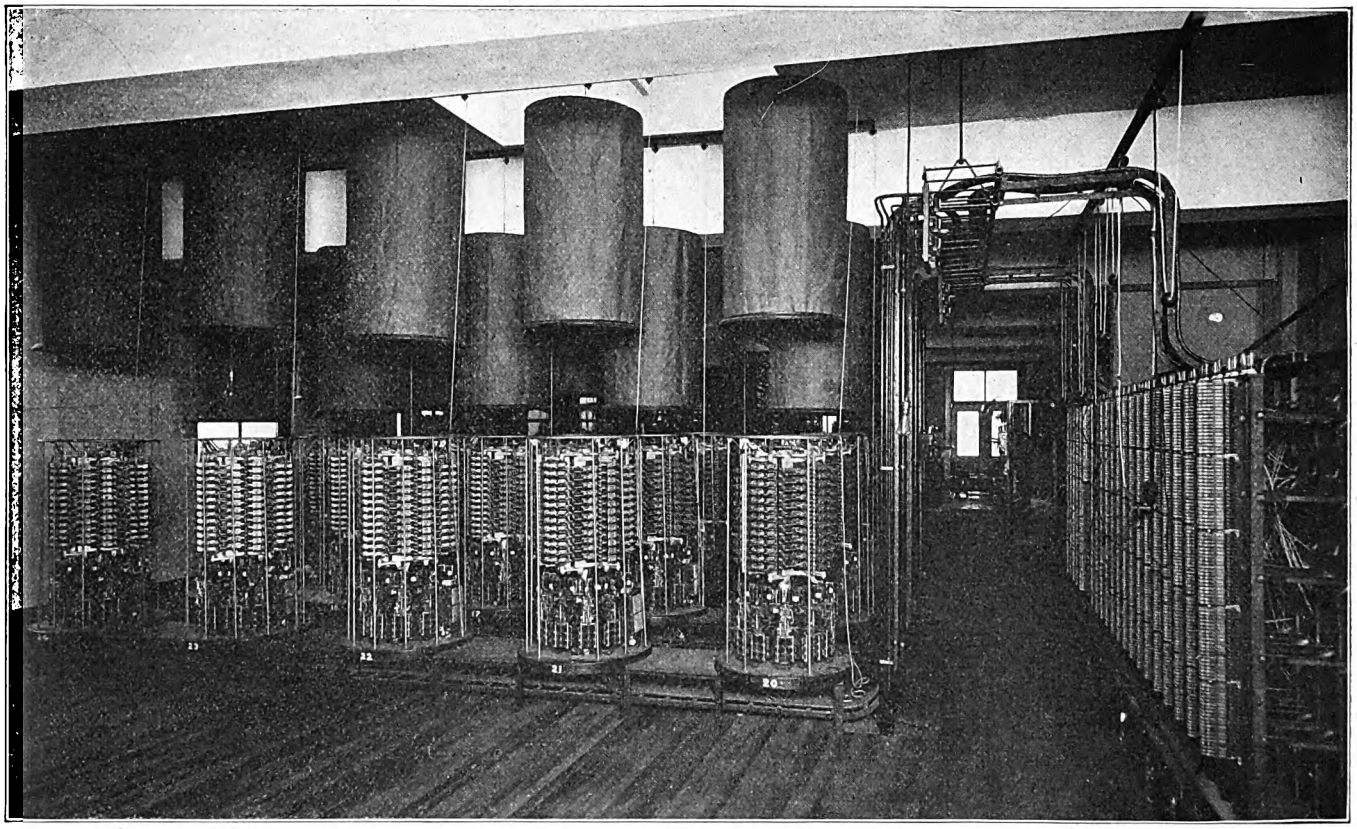
The company owns its own building in Butte, which is a fireproof structure, and, in addition to housing the Butte exchange, it will be used for the general offices of the company for the entire state. The company also intends to erect its own buildings in Great Falls and Helena.

The Montana Independent Telephone Company has been financed on a conservative basis. Its securities have found a ready market among Montana investors and all the money in the enterprise is Montana capital. There are more than four hundred stock and bond holders, and these men represent nearly every large interest in the state as well as every trade and profession. In the broadest sense of the term the company is a popular one.

The building is three stories high, constructed of reinforced concrete, and cost about $40,000. The general and local offices of the company are located on the first floor, which has been artistically arranged for this purpose. The toll room and public telephone booths are also on this floor. The basement is used for a store room and testing department. On the second floor are located the storage batteries. The entire third floor is devoted to the switchboard with the exception of a small room in front, which is occupied by the engineering department. The switchboard room is well suited to the purpose, having been designed especially for this use, with windows on three sides and four large skylights to give abundant light.

The present installation of automatic equipment, which the Automatic Electric Company has just completed installing, consists of the latest common battery system, 1,500 straight line switches and 500 four-party line switches, designed to care for an ultimate exchange of 8,000 lines. The straight line equipment is of the latest type line switch, which has been installed and operated with so much success in various exchanges during the past year and a half. As will be seen by reference to the illustrations, the straight line equipment consists of fifteen line switch units, each serving one hundred lines. These units are trunked to a trunking section, where the selection of numbers is made in the manner common to all automatic exchanges of this manufacture. These boards are located in the north end of the room, being mounted on structural iron frames in three rows with five to the row. Space is left for an addition of five rows with five boards to each row, or 2,500 switches. The boards are numbered—board No. 1 serving subscribers numbered from 1,000 to 1,099; board No. 2 serving subscribers from 1,100 to 1,199, and the remaining straight line subscribers are similarly distributed.

Board No. 24 is especially arranged for the use of business houses with more than one trunk line to the exchange. This board is equipped with a rotary instead



Straight Line Switchboard and Distributing Rack.

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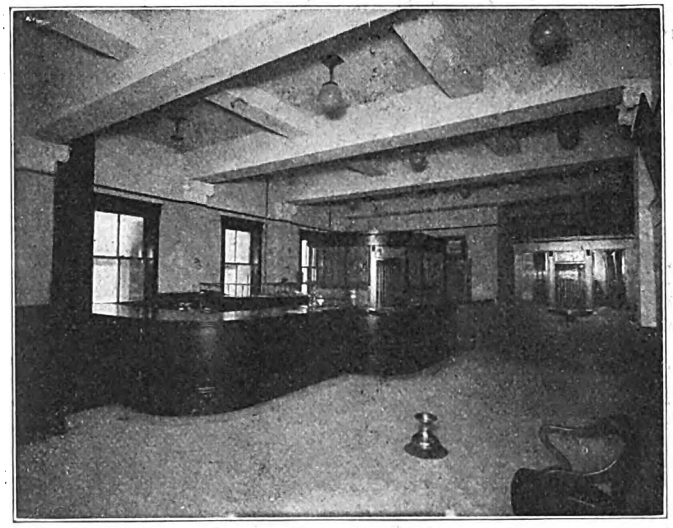
of the ordinary connectors. The special advantage of this rotary connector being that when the wiper fingers strike a busy trunk line it does not drop back to its normal position like the ordinary connector, but passes over the busy trunk lines to one that is not busy.

These line switch units are protected from dust by canvas covers which are raised and lowered from above by ropes and pulleys.

The power terminals for these boards are hung from



General Office.

the cable runway above and between the switch board and distributing frame. On these power panels are the fuses for feed wires to the switchboards.

The board containing the trunking first and second selectors is on the east side of the room close to the line switchboard. These switches are used in connection with the line switches, the first and second selectors setting up the first two figures of the number called and the connector on the line switchboard completes the call in the

Office of Managing Director.

usual way. In this board are 150 first selectors and 150 second selectors, with additional space for 250 more of each. These switches are protected from dust by glass doors.

Next to the trunking section is the party line board. In this board there are 500 switches with space for an addition of 500 more. This board is equipped with the Automatic Electric Company's four-party harmonic ringing system.

The harmonic converter, or ringing machine, which provides ringing current for the entire exchange, and which is installed in duplicate, furnishes current of four cycles, namely, 16, 33, 50 and 66, of which the 33-cycle current is used for the straight line telephones, and the 16-cycle for long distance lines. The harmonic ringing device is also equipped with a busy signal, for notifying calling subscribers when line called is busy.

The party line equipment, which allows two, three or four parties to be operated on one line, makes use of the harmonic ringing principle, and, while ringing on party lines in non-interfering and selective, it does not necessitate the use of the lockout device. Trunks between the party and straight line switches with an increase over the standard 10 per cent equipment in four of the party line boards, takes care of all calls between party line and straight line switches.

The power plant consists of a two-panel, pink Tennessee marble power board, fitted with Crouse-Hinds switches and Weston instruments, duplicate sets of Gould storage battery, 320 ampere hour cells, 25 cells to each set, with room in tank for an addition of 640 ampere hours' capacity and two charging sets, each consisting of a 10 h.p. Allis-Chalmers three-phase induction motor,

Toll Board and Information Desk.

connected direct to a Holtzer-Cabot 75 volt, 80 ampere generator. The power plant throughout is in duplicate and of sufficient capacity to operate in connection with an exchange of 10,000 lines, or may be added to from time to time in accordance with the growth of the exchange.

The telephones, that is, in addition to the standard Automatic desk sets, vary but slightly in appearance and finish, all instruments being of the common battery type, and finished in both ebony and antique oak, to suit the taste of the subscriber.

The toll board, information desk, and wire chief's desk are finished in mahogany. The toll board and information desk are installed on the first floor, in the rear of the general office. The signals are of the visual lamp type, with double supervision for cord circuits. The toll board is also provided with ten circuits for pay stations, which are operated as manual telephones under direct supervision of the operator. The wire chief's desk, which is located in the switchboard room, is of the two-position type, one position being used for the trouble clerk. This position is in multiple with the information desk on the first floor, so that both desks can be taken care of by one clerk at night. The wire chief's desk is provided with the standard volt meter and testing circuits,

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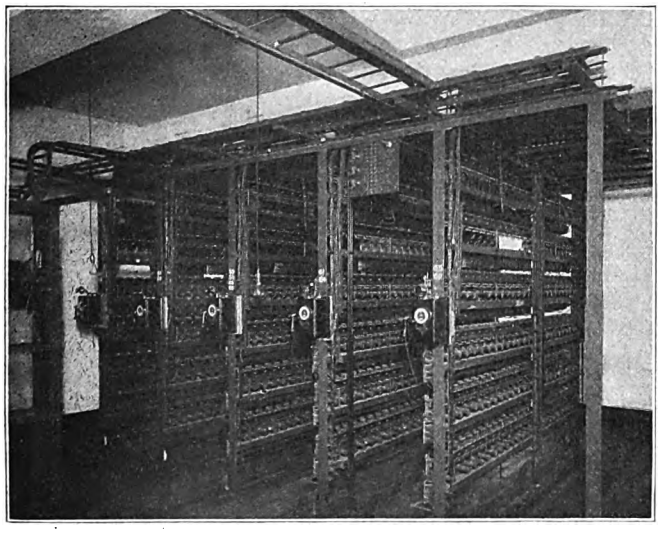
such as are commonly used in both automatic and manual exchanges.

One of the most interesting features in the Butte exchange is the "tell-tale" circuit. Not only are all fuses and heat coils throughout the exchange provided with alarms, but also the driving mechanism of the line switches are furnished with a visual and audible signaling device, which calls the attention of the attendant at once when anything goes wrong. The party line switches are provided with small semaphores, so that switches in operation can be detected and singled out at a glance.

The outside construction is mostly cable. All the cables in the business district are underground, and are aerial in the residence district; open work being used only in the outlying parts of the city. The eight cables enter the basement from a large manhole in front and one cable enters from the rear. They are carried up through a cable chute in the west wall to within about three feet of the third floor, where they are spliced to 25-pair lead-covered switchboard cables. These 25-pair cables run under a false floor to their respective terminal blocks on the main distributing frame.

Four of the line cables are 400-pair, two are 350-



Party Line Switchboard.

pair, one is 250-pair, one is 200-pair, and one is 100-pair, making a capacity of 2,850 metallic lines.

At the underground cable terminals, ring distributing poles with can top cable boxes are used.

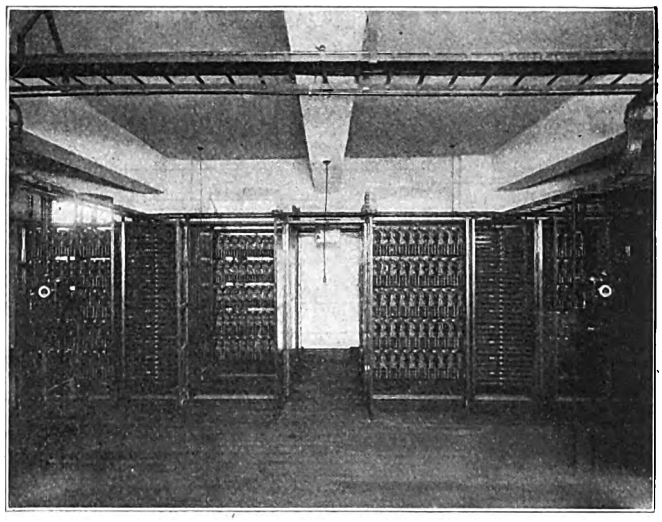
On acount of the difficulty encountered in getting good grounds at many of the stations, the engineers in charge of the construction decided to use a system of common ground wires. These wires in the aerial work are strung on the tops of the poles and connected to the cable armor, thus insuring a perfect ground. All ground wires from the telephones are connected to this common ground wire. At the ring distributing poles a wire is run around the ring beneath the pins and connected to the cable armor. This scheme has proved to be a successful one, as it entirely does away with poor grounds at the telephones.

Some idea of the size of the switchboard room can be gained from the fact that it embraces a main distributing rack and switchboard with an installed capacity of 3,500 lines and an ultimate capacity for 10,000 telephones.

The main distributing frame is of the F. B. Cook type, No. 10, mounted 100 pairs upright on the switchboard side and 125 pairs on the line terminal side. The frame consists of 23 vertical upright columns; 1, 2, 3, 4 and 5 being for party lines; 6 and 7 for toll lines and 8 to 23 inclusive for straight lines. The cables from protectors to switchboard are carried overhead on iron runways.

The outside construction was done by the General Engineering Company of Chicago under the direct personal supervision of Mr. E. W. Hammer.

The installation of the automatic equipment was in charge of Mr. A. F. Bennett, of the Automatic Electric Company, and a corps of assistants, and Mr. Bennett is



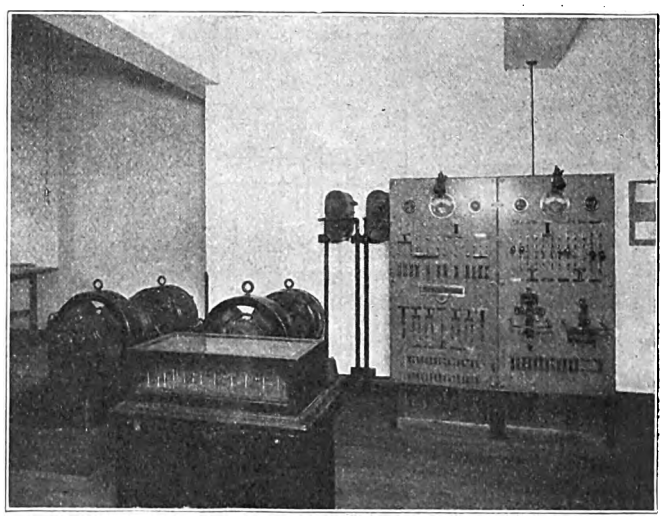
Trunking Section for Line Switches.

now superintendent of equipment at the plant, he and many of his assistants having entered the employ of the Montana Independent Telephone Company.

The entire construction of this exchange has been in the hands of expert engineers and the equipment is the best and most up-to-date in the United States. Situated as it is in a hustling city of 80,000, with practically no competition, it gives promise of becoming one of the foremost telephone plants in the country.

Telephone Service in Asia.

Consul George Heimrod reports that Apia and adjacent plantations in Samoa are now provided by the postal



Power Plant.

authorities with telephone communication. Within a radius of 5 kilometers (kilometer = 0.62 of a mile) the fixed rate for this service is 200 marks, or $47.60, per year, and for every 100 meters (328 feet) service beyond said line an additional charge of 4 marks, or 95 cents, is exacted.

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Some Questions Answered

By Arthur Bessey Smith

Instructor of Telephone Engineering, Purdue University.

Editor SOUND WAVES: Will you kindly show me with a diagram what kind of a wiring circuit I should use to operate one lamp from two points with two snap switches, so that the lamp may be lighted by one and turned out by the other or vice versa.—C. A. S.

One circuit for doing this was given in July SOUND WAVES, page 79. But there are two other methods of wiring which are given in Figure 1. They are self-

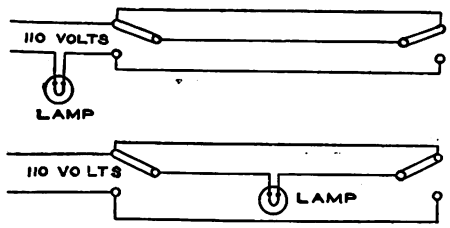

Figure 1.

explanatory, and are shown in the unlighted position of the switches. One of the three circuits may be found to fit a given case better than the others on account of less wire required.

Editor SOUND WAVES: How many volts do the Edison RR primary batteries have? How many RR cells will it take to equal eight dry cells in voltage?—W. M.

The voltage of the Edison cell is about 0.66 volt. It is the same for all sizes. The dry cell has about 1.47 to 1.50 volts on open circuit when new. Call it 1.45 to be on the safe side. Eight cells will give 11.6 volts. Dividing this by 0.66 we get 17.6 which is the number of cells of Edison to give the same E. M. F. This means 18 cells. The voltage of the dry cells will fall off more rapidly with use than the Edison cell.

Editor SOUND WAVES: Please give me an idea how to wire a relay in the vibrator circuit so as to stop the vibrator when

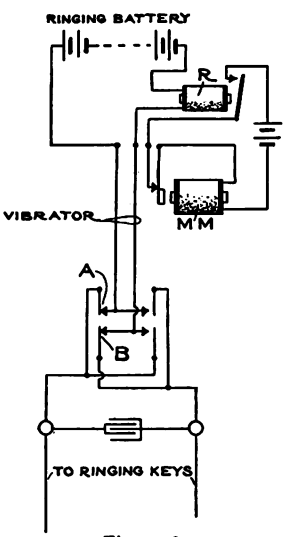

Figure 2.

the pole changer is not in use. I would like to put a relay in the vibrator circuit so that when I press the switchboard cams the pole changer will vibrate. Can you give me a circuit of the same, showing how to connect the relay? And what resistance must the relay be?—W. C. M.

The circuit desired is shown in Figure 2. *MM* is the motor magnet which makes the vibrator move. Its make and break contact is shown just in front of it. *R* is the relay in question and is in the circuit of the ringing battery which leads to the vibrator. The points, *A* and *B*, on the vibrator must normally rest against the left hand springs as shown, so that the ringing battery will be connected at all times to the keys. When the operator plugs into a line and presses the key, the ringing battery furnishes current through *A* to the line, through the subscriber's bell, back through *B*, and through the relay *R*, to battery. This flow of direct current pulls up the relay, which closes the motor magnet circuit. When the operator ceases to ring, the relay falls back and stops the motor magnet.

Editor SOUND WAVES: What is meant by "per cent" of troubles?—J. P. A.

In comparing the number of cases of trouble which different exchanges have there must be some logical basis for comparison. It would be obviously unfair to contrast the number of troubles occurring in a 10,000 line exchange with those in a 500 line. To reduce them to approximately the same basis, the differing sizes of the two are accounted for by dividing the number of troubles in one day by the total number of telephones. If a plant containing 1,000 telephones has ten troubles in one day, the ten troubles would be one per cent or .01. As the number of troubles vary so much from day to day it is customary to take the average daily troubles for a month and figure on that basis. It should be noted that it is the total number of telephones that counts, not the number of lines, as each connected telephone is a source of trouble. There is some opinion that the per cent of troubles should in some way take into account the traffic conditions, that is, the amount of use which the telephones receive. While it is true that the size of traffic has some effect on the number of troubles, yet there are some troubles which occur whether the telephone has been in use or not.

Editor SOUND WAVES: What man was it who worked out the laws of electricity in a remarkably short time? Can you give his name and some of the particulars? I shall be very much obliged.—T. C.

The man to whom you refer is doubtless Ampere. His eight-day feat in working out the laws of electromagnetic influence is well known and is one of the proofs of greatness in this remarkable man.

Andre-Marie Ampere was born at Lyons, January, 1775, and died at Marseilles, June, 1836. He was extremely studious from his childhood. He possessed an excellent memory. Long before he knew the meaning of figures he worked out problems with pebbles and biscuit crumbs. In 1819 Professor Oersted of Copenhagen made the discovery that a wire carrying a current of electricity would deflect a magnetic needle when placed near it. He also noticed that the amount of deflection varied with the strength of the current and the direction of deflection depended on the direction of the current. The news of the discovery was carried to Switzerland, where a member of the French Academy residing in Geneva heard of it. September 11, 1820, this member

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delivered an address at the weekly meeting of the Academy in Paris and repeated Oersted's experiments. Ampere was there and was greatly impressed. He went home and began experimenting with the result that he carried the discovery of Oersted so much farther that the friends of the latter feared the eclipse of Oersted's fame. On the 18th of that same month Ampere presented a paper to the Academy in which he recited his investigations, all of which had been made in the intervening time. He demonstrated that magnetic effects can be produced by current-carrying wires without magnets at all, that parallel wires have an effect on each other depending on their distance apart and the strengths of the currents and showed what that relation was. The experiments which he devised to prove these points were very ingenious.

Editor SOUND WAVES: How can I best make a short temporary cable? It is to be not over 20 feet long and will be exposed to the weather. It will not be in use long enough to pay to buy a regular cable.—L. J.

There is some doubt as to what a "short" time means, but if it is not more than two or three months the following will answer very well: Get a sufficient quantity of "special telephone wire" which is the usual designation of copper wire, rubber covered, braided, then twisted in pair, with a tracer. Bunch the required number of pairs together and lace them with common stout twine. Then serve over the cable a layer of black friction tape. This will give you a cable which will serve very well for some time. When you are through with it, you can take off the tape and use the wire for house runs or other wiring.

Editor SOUND WAVES: What is the meaning of the term "practical unit"? I have been reading about electrical measurements and find the volt referred to as the practical unit. Is there any unit which is not practical? Please answer through SOUND WAVES and oblige.—C. T. B.

The term "practical" arose from the fact that in working out the so-called "absolute" system of measurements for all kinds of forces, the centimeter, gram, and second were chosen as the fundamental basis of length, mass, and time. Mass is only a more exact way of stating the quantity of matter which we ordinarily express as weight. In building up this absolute system the desire was to have such units as could not change with time. The old units were derived from very crude notions. For instance, the yard was once the length of a certain man's arm. It was thought to preserve the units from change by preserving a standard at the seat of government. But the standard might be lost or destroyed or change in time. But the centimeter depends on the length of the quadrant of the earth, the gram on the laws of the movement of a body under the action of a force, and the second on the movement of the earth. These never change. Some of the electrical units which resulted from this system are too large and some too small for practical use. It takes 10^8 or 100,000,000 absolute units of electromotive force to equal one volt. On the other hand, the unit of capacity was vastly too large. So we use a millionth of it, the microfarad.

Editor SOUND WAVES: We are getting some telegraph noise on one of our farm lines and would like some suggestions as to where it is coming from, as the line does not run parallel to any telegraph line at all. I am enclosing a diagram showing how the lines run. No. 3 is the line which is noisy. It is single wire, ground return, and Nos. 1 and 2 are the same. The toll line is iron metallic, No. 10, and is well transposed. We never get any telegraph noise on the toll line except when it gets grounded. No 1 is as quiet as any grounded line and we do not get any telegraph clicks on it nor on No. 2. If you can give us any light on the probable cause of this trouble, I shall be greatly obliged.—R. B. Y.

The circuit submitted by the correspondent is shown in Figure 3. *W* is the central office from which the lines run. *N* is the other end of the toll line. Apparently line No. 3 runs parallel to the toll line and quite close to it for some distance. It is most likely that the railroad which is shown as running past *N* has its telegraph line very near the toll line. If this is the case, undoubtedly the toll line is carrying noise to line No. 3. It can do

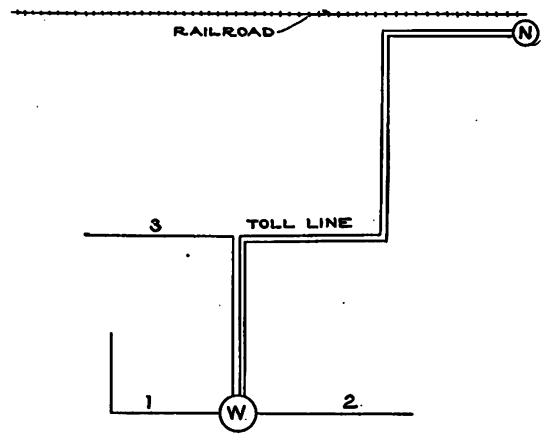

Figure 3.

this even if quiet itself. All wires which parallel each other have mutual capacity, that is, they act as if a small condenser were connected from one to the other. There is a condenser effect between the telegraph line and the toll line near *N*. There is a similar effect between the toll line and No. 3. The charging and discharging of the telegraph line sets up a disturbance in the toll line, and the currents thus produced flow along the toll line and to ground through the telephones of No. 3. The conditions are roughly represented in

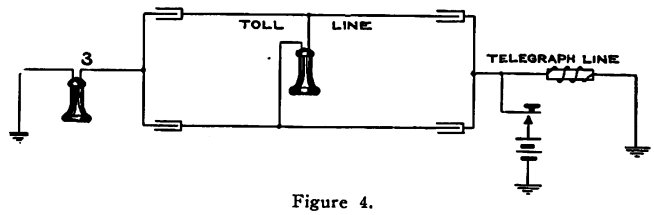

Figure 4.

Figure 4, where this capacity relation between the lines is symbolized by condensers.

Since the toll line is well transposed, these foreign currents flow over each of the two wires with equal force and have no effect on receivers connected across them. This is a wonderful fact in long distance telephony, that a toll line may be very quiet and yet have strong currents flowing over each of the wires. When a telephone man kills the noise due to induction by transposing, he has not got rid of the current but merely balanced them so that they will not flow through the telephone.

Editor SOUND WAVES: What is the effect of a reversed pair of wires in the operation of an automatic telephone?—E. D. J.

The effect of a reversed pair is that the subscriber on whose line the mistake has occurred will not be able to call as he desires, but will always get 111, or 1111, depending on the size of the exchange. To see how this comes about we must take a short look at the conditions of normal operation. The Strowger automatic, which is

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ent time, employs two wires and ground return for selecting. One of these wires is called the *vertical,* and is used chiefly as an impulse wire. Over it all the step by step action is carried on. The other wire is the *rotary,* and is the switching wire. By its aid we are able to change the vertical wire from switch to switch in the central office and determine which machine its impulses shall operate. Figure 5 is a schematic diagram of the first selector and connector. It does not show actual connections in every case, but will enable one to grasp the underlying principles.

The vertical and rotary wires come in at the left as *V* and *R*. One end of battery is connected to ground. The vertical wire goes through the vertical relay, *VR,* to battery, while the rotary wire is attached in the same way to the rotary relay, *RR*.

Switches 1 and 2 are normally open. In selecting a number, let us suppose 345, the first act performed by the dial is to ground the vertical wire three times. This gives three impulses to the vertical relay, which in turn makes the vertical magnet, *VM,* pull up three times, lifting the wipers three notches. The latter are now opposite the row of contacts leading to the third hundred. The dial next grounds the rotary wire once. This operates the rotary relay, *RR,* which pulls up the private

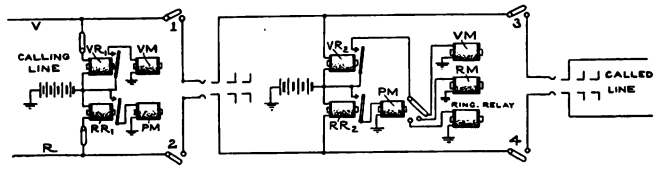

Figure 5.

magnet, *PM*. The private magnet sets in motion some automatic devices which rotate the wipers till they srike a trunk line which is not busy. It then automatically opens switches 5 and 6, and closes 1 and 2. We are now connected to the connector at the end of the trunk line in the third hundred.

The next act of the dial is to ground the vertical wire four times. This now operates the vertical relay, VR_2, of the connector. Since switch 7 is on its back point, this operation of the vertical relay will make the vertical magnet, *VM,* pull up as may times as the line is grounded, thus lifting the wipers to fourth level, the forties. The dial then grounds the rotary wire once, This operates the rotary relay, RR_2, which makes the private magnet, *PM,* move switch 7 over to the next point. This connects the contact of the vertical relay to the rotary magnet. When the dial grounds the vertical wire five times, the vertical relay now moves the rotary magnet, *RM,* so as to rotate the wipers to the fifth point in the row, which is the number desired, 345. Finally the dial grounds the rotary wire once, which moves the private magnet to its last point besides closing switches 3 and 4. When the subscriber presses the ringing button he grounds the vertical wire, which causes the vertical relay to pull up the ringing relay and ring the called line.

The acts in selecting may be summarized as follows:

Dial Call.	——No. of Impulses on—— Vertical.	Rotary.
3	3	
		1
4	4	
		1
5	5	
		1
Ring.	Button—1	1

The above are the operations which the dial performs when the number, 345, is pulled. Now, if the linemen in working with the wires have reversed a pair, it means that the real vertical wire from the switchboard has been connected to the dial mechanism where the rotary should have been, and the rotary wire has the vertical wire's place. The call will now come in as follows:

Dial Call.	——No. of Impulses on—— Vertical.	Rotary.
3		3
	1	
4		4
	1	
5		5
	1	
Ring.	Button—1	1

When the rotary is grounded three times it has no effect on the switch. The succeeding ground on the vertical lifts the wipers of the first selector one notch. The four grounds on the rotary operate the private magnet and select a trunk to the first hundred. One impulse alone would be enough to secure the trunking, but the four do no harm. The next impulse of one on the vertical steps the wipers of the connector up to the first level. The five impulses on the rotary shift the switch 7 one notch, for there is a mechanical arrangement which prements it from moving to the last point till the wipers have moved into the bank. The final impulse of one on the vertical rotates the wipers one step. The pressing of the ringing button will operate the rotary relay and private magnet, so that 7 goes to the last point and 3 and 4 are closed. Thus we are landed on 111.

The same action will occur on an exchange of any size, the subscriber getting as many "1's" as there are digits in the call.

Editor SOUND WAVES: Will you please explain how the Bell common battery operator's set works? I mean the anti-side-toe circuit. It looks to be as if there is considerable loss by having the receiver shunted by one of the secondary windings and that resistance. Please answer in your paper.—P. R. R.

Figure 6 gives the circuit to which reference is made. This circuit will transmit speech without appreciable loss through the receiver, but in receiving it is not as efficient owing to a slight shunting effect which the 490 ohm coil has on the receiver. However, the 490 ohms is largely inductive and the shunt ratio will be

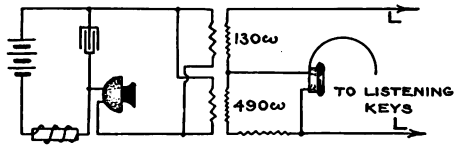

Figure 6.

more favorable to the receiver than a comparison of resistance would indicate.

When the operator talks into the transmitter, she will not under ordinary circumstances hear her own voice. This is under the condition that a circuit is connected to *LL*. The principal involved is the same as in the Edison three-wire lighting system. Figure 7 will make it plainer. We must regard each of the secondary windings of the induction coil as an alternating current dynamo. Thus from 1 to 2 is one dynamo, and from 2 to 3 is the other. The two produce equal voltages. This is insured by giving each its own primary and building them alike. From 4 to 5 is the extra resistance portion of the 490 ohm winding, and it corresponds to

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one side of the lighting circuit, a certain load. From 5 to 6 is the circuit to which the operator is talking, and corresponds to the other portion of the lighting load. The receiver is in the neutral wire. Now, it is a well-

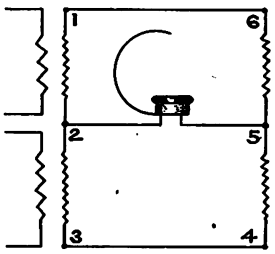

Figure 7.

known fact that if both dynamos are kept at the same voltage and the two loads are equal, there will be no current flow in the neutral wire. If there is any difference the neutral merely carries the difference in current.

Editor SOUND WAVES: What is the most economical way to amalgamate battery zincs? I have quite a number to do and find the ordinary method of rubbing the mercury on not very satisfactory.—A. M. S.

As you have a number of zincs to amalgamate it will pay you to make up a solution for the purpose. Mix together two ounces of mercury, one ounce of aqua regia, and ten ounces of hydrochloric acid. The mercury should dissolve. Keep it in a closed bottle when you are not using it. For use pour it into some dish which will fit the shape of the zinc so as to be economical of the solution. See that the zinc is clean before you dip it. When you dip the zinc into the solution you will notice bubbles begin to form all over the surface. Hold it in only long enough to get pretty good action all over the zinc, then take it out and rinse in clear water. This method beats all the rubbing, and is quite economical of mercury.

Editor SOUND WAVES: What is the size of granular carbon used in transmitters? Is it the same in all?—J. M.

For local battery work it is customary to screen the granular carbon through a seive which has 60 meshes per inch. All that passes through is rejected. It is then screened with a 65 mesh screen and all that will not pass through rejected. For common battery work the mesh is finer, being about 100-110. The size of granular carbon is not the same for the same service with the different manufacturers.

Editor SOUND WAVES: Is there any marked difference in the action of line troubles on an automatic exchange from on a manual? Are they likely to be any more troublesome? Can you give the effects of some of the core common troubles?—S. T. D.

The most marked difference between the effects of line troubles on manual and automatic is that they show up at central much more quickly on the latter than they do on the manual. From 40 to 75 per cent of the line troubles may be detected by the attendants and often fixed before the subscriber has had time to report his line as being in trouble. On account of the high voltage employed the insulation is a little more likely to break down and give grounds, but we all know that good insulation improves the transmission and if this increased voltage forces us to get our lines in better shape it is so much the better.

A dead ground on either line is very likely to blow the heat coil. If it is the vertical wire that grounds, it will stop the wipers up and the first selector will show up as "off normal." If it is the rotary side, the wipers will not move, but the heat coil may blow. A swinging ground on the vertical side makes the wipers step up till they reach the top, after which the relay keeps on clicking every time the line swings into ground. The selector also shows up as off normal and is quickly found. The swinging ground on the rotary line will merely make the rotary relay chatter.

A short line will not show up till the subscriber tries to make a call. Then both the vertical and the rotary relays will pull up at once and the switch makes an extra amount of noise without getting anywhere. The switchboard man soon learns to know the normal sounds of the switches, and any irregularity is easily noticed.

An open in the vertical line will keep the subscriber from getting anything. While he is working the dial, only the rotary impulses will come in. If it is the rotary that is open, the first pull of the dial will step the wipers up all right, but the rotary impulse failing to come in the side switch will not be operated so that no trunk can be selected. The next pull of the dial will raise the wipers still higher. The switchboard man will notice the omission of the rotary click, also the first selector will show up as off normal. Of course, all this discussion has been on the basis of the old system of one first selector per line. With the new line switch the action will be somewhat different.

Editor SOUND WAVES: Can you give me a method and circuit for charging a high voltage battery from a low voltage generator? I have a 30-volt generator and wish to charge a battery of 24 storage cells. Is there some switching arrangement which will take care of the connections so that there can be no mistake? Is so, will you kindly show how it is wired?—L. L. M.

The circuit which you desire may be arranged as shown in Figure 8. You will need a four-pole, double-

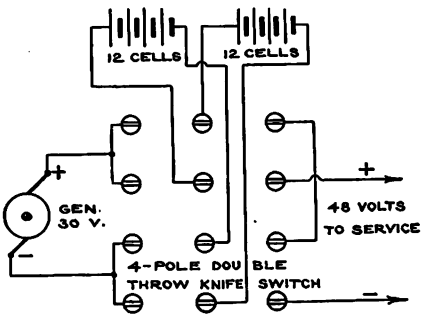

Figure 8.

throw knife switch of sufficient capacity to handle the current which your cells require for charging and which they are expected to furnish when in service. Wire as shown, splitting the battery into two parts. When the switch is thrown to the left, the two sections of twelve cells are in parallel and connected to the dynamo. When the switch is thrown to the right, they are in series and connected to the circuit which you desire to feed.

Improved Swedish Telephone.

Sweden's government has fostered the use of the telephone for a number of years, with the result that in some parts of that country the instrument is in more general use than anywhere else in the world. There is being introduced a form of telephone transmitter so sensitive that it is not necessary to talk directly into the mouth-piece. The new design has a very large bell, which is held anywhere in the vicinity, but not directly at the mouth.

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International Independent Telephone Association.

Chicago Headquarters—Arrangements have been made to remove the association headquarters to Monadnock Building, Chicago, November 1st. The transfer will be completed not later than November 10th, after which date correspondence should be sent to the new address.

The 1908 Convention—January 21, 22 and 23 have been selected as the dates of the next annual meeting, which will be held at the Coliseum, Chicago, in connection with the Electrical Show, the event of the year for the electrical industries. Exceptionally fine exhibits are being planned by the various telephone manufacturers and supply dealers, and in addition to these, all attending the convention will have an opportunity to view the splendid exhibits made by manufacturers of kindred lines of electrical apparatus, so that the exhibits alone will be a feature the up-to-date telephone man can hardly afford to miss. As the time selected is the most convenient possible for the majority of telephone men, the attendance promises to exceed that of last June, which broke all previous records. There are many important matters to be considered at the January meeting and no efforts will be spared to arrange a program that will be extremely interesting and helpful. Due attention will also be given to providing suitable entertainment. We want to make this convention an unqualified success in every way, and ask the hearty co-operation of all interested to that end. Do *your* part. Start now to boost the 1908 convention.

Convention Delegates—State and provincial associations should arrange to select their delegates and alternates to the convention as soon as possible, to avoid delay in preparing proper credentials. Blanks for reporting representatives selected may be obtained from the general office.

Suggestions Desired—With a view of making the convention thoroughly representative, every one in the field is invited to send in suggestions for papers, discussions or special features, and officers of the various associations are requested to submit the names of their members who would make suitable timber for the various committees.

Make Reservations Early—Manufacturers and others desiring to exhibit at the Electrical Show during the convention will do well to give the matter early attention. Make all arrangements with Mr. Homer E. Niesz, Manager, Electrical Trades Exposition Company, 1006 Monadnock Building, Chicago.

Assessments—Some associations have not yet paid anything on installments due on assessments. Remittance should be made promptly. Delay seriously hampers effective work being done.

Publicity—The establishment of this department is held up on account of finances, and until a man has been selected for handling publicity, the president will endeavor to carry on a certain amount of the work. All in the field are urged to give this department the assistance necessary to its success by responding promptly when called upon to furnish information for its use. If the publicity department can help you, remember, it is at your service.

Meetings.—Commendable activity is being displayed by quite a number of the state associations in arranging district meetings. Other states should give this matter immediate attention. It is very important; the progress of any association depends in a large measure upon the success of district meetings. A number of states have already decided the dates for their next annual meetings. Others should do so without delay, and, whenever possible, arrange to hold these meetings before the International convention. The association will endeavor to have a representative at all state meetings.

Financial Statement.—Apportionment by Executive Committee for 1907-8:

ASSOCIATIONS.

Arkansas	$ 100.00	
California	300.00	
Canada	25.00	
Illinois	750.00	
Indiana	1,000.00	
Iowa	700.00	
Kansas	400.00	
Kentucky	200.00	
Maine	25.00	
Michigan	750.00	
Missouri	500.00	
Nebraska	350.00	
New York	300.00	
North Carolina	25.00	
Ohio	1,300.00	
Oregon	40.00	
Pennsylvania	500.00	
Texas	100.00	
Vermont and New Hampshire	25.00	
Virginia	50.00	
West Virginia	250.00	
Wisconsin	250.00	
		$7,940.00

CONTRIBUTIONS AND PLEDGES.

Swbd. and tel. mfrs.: Equipt. stamps.	$6,500.00	
Supply dealers and jobbers	5,000.00	
Engineers	250.00	
Journals	250.00	
Operating companies (paid in July and September, 1907, $240)	750.00	
Special (paid in October, 1907, $2,000)	4,000.00	
		$16,750.00

GENERAL.

Honorary membership fees (paid in June, 1907, $50)	$ 750.00	
Miscellaneous accounts	475.55	
		$ 1,225.55
Total		$25,915.55
Paid in		2,560.05
Balance to be collected		$23,350.50

Annual assessment 1c per unit. A unit is an operating telephone or a circuit mile of toll line. Assessments are payable monthly, and are based on number of units in respective associations at last convention.

FISCAL YEAR, 1906-7, CLOSED MAY 25.

Total receipts this year to date, including special committee, balance	$15,673.20	
Total expenditures, including accounts accrued before last convention...	12,733.88	
		$2,939.32
Accounts payable	$ 1,080.42	
Estimated expenses for next thirty days	1,267.50	
		2,347.92
Surplus, November 15		$ 591.40

Proper Accounting—Every Independent telephone company should earn and pay dividends. If your company does not, there is something wrong. Find the leaks and stop them. Proper accounting will show you where and what they are. If your system of accounting needs revision, better give it attention now. Copy of standard forms may be obtained free from the general office.

Discontinuance Sale—All stock of the Supply Department has been practically sold out, with the exception of a number of colonial lanterns, some large transparencies and a few cuts of various sizes. Prices, which are just about factory cost, have been placed on these to move them quickly. If you are not supplied, better take advantage of this opportunity while it lasts. We desire to thank the Independent people throughout the country who have assisted in closing out the supply department stock.

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The Clement-Automanual System

By J. F. Engle

TELEPHONY is still a youthful art, but in its brief existence it has developed amazingly. This has been partly due to the general industrial development of the times, which has laid a constantly increasing burden on all systems of communication. It is also due, however, to the fact that some of the best brains, aided by bold and enterprising capital, have labored unceasingly to produce systems and apparatus capable of satisfying the constantly growing demand. Too much credit can not be given to the men of intelligent capacity and the men of money who have brought the art to its present state of usefulness.

Edward E. Clement.

Almost at the outset of the development, telephone systems and apparatus became divided into two classes, the manual and the automatic. For various reasons, the manual apparatus came into common use at an earlier date than the automatic. However, with the demand for better service and economy in large installations, the automatic has also come into extended commercial use. Each claims to meet present commercial conditions. In the manual systems the operators are loaded with work which should be relegated to machines; and in the automatic systems machines are widely scattered at subscribers' stations where only the simplest manual apparatus should be employed. A lack of flexibility characterizes both systems, but in spite of this the advocates of each have been blind to the valuable features they might borrow from the other.

The Clement-Automanual system is a combination of the two old types. It employs certain standard parts taken from the manual systems, and certain standard parts taken from the automatic system, eliminates all the undesirable features of both systems, makes each part do only what it is best fitted to do, and as a result gives better service than any heretofore possible, with greatly reduced operating expense. The actual saving effected in operators alone is from forty to eighty per cent.

Charles H. North.

The Clement - Automanual telephone switchboard will compare favorably with any of the most advanced inventions and improvements that have been made during the past fifty years, and certainly since the invention of the telephone. It is an invention controlling basic rights and marks a decided improvement in the telephone art. It is a far greater improvement over other types of telephone switchboards now in use than the multiple switchboard when invented was over the old-fashioned transfer board. The Clement-Automanual will be to the telephone field what the air brake has been to the handling of trains and what the self-binder has been to the farmer in handling his harvest.

This system is neither an accident nor a sudden inspiration, but the fruit of several years of deliberate, logical, systematic study and work on the part of Mr. Edward E. Clement, who has a wide reputation as a telephone engineer and author. Mr. Clement was assisted in this work by an organization of experts, and had at his disposal ample means and a completely equipped experimental factory devoted exclusively to this development.

Mr. Clement is comparatively a young man, thirty-nine years of age, born in New Jersey, of German and English parentage, was educated in the public schools, the United States Naval Academy, and Law School of the National University.

His time prior to 1890 was spent in acquiring his education, three years of this time being spent in general engineering, and two years in the office of Maclay & Davies, New York. In 1890 he was appointed to the United States Patent Office as an examiner and assigned to the class of hydraulics for one year and then transferred to the electrical division, remaining there until 1898, his work covering all classes under telephony, telegraphy, electric lighting and signalling. For several years Mr. Clement had exclusive charge of the branch of telephony.

He studied law while in the Patent Office, graduating with honors in 1893, being admitted to the bar in the same year. In addition to his regular work he served as a member or chairman of a number of committees appointed by the Secretary of the Interior to pass upon technical matters, including telephone systems built for the Interior Department at Washington. He resigned from the government service in 1898 and entered private practice, forming a partnership with Mr. William D. Gherky, of the Philadelphia Traction Company. This partnership was dissolved in 1900, since which time he has been connected in one way or an-

James G. Hoge.

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other with the various electric manufacturing companies, and especially with the Independent telephone development, has been and is connected professionally as attorney or engineer, or both, with all the large Independent telephone manufacturing companies any many other electrical manufacturers and operators.

After he had developed the scope of his inventions he laid the entire propositions before Mr. James B. Hoge, of Cleveland, Ohio, who organized the National Engineering Corporation for the purpose of systematically developing this system which would give better and quicker service to the existing exchange companies without the necessity of making a radical change in the outside construction work. This company was organized under the laws of the District of Columbia, and a number of the most prominent operating telephone men were brought into it; a laboratory was opened in Washington, which a little later resulted in establishing a factory in Baltimore, where machinery was installed and the business of manufacturing carried on. During this period of development the entire matter was kept secret, and this is the first time anything has been published with reference to the Automanual, the policy of the corporation being to complete the system and place it upon a sound commercial basis before making any public claims for it.

After this had been accomplished the officers of the National Engineering Corporation, realizing that their factory in Baltimore was not properly located to handle this business, and after carefully canvassing the field for a suitable connection in order to insure the successful manufacture and installation, completed, on August 1 last, a consolidation with the North Electric Company of Cleveland. This gives the North Electric Company complete control of the United States and Canadian patents. This company is an old, well-established manufacturing firm that has been making telephone equipment for over twenty years. The Clement-Automanual added to its regular line puts the company in the field prepared to not only make a specialty of that equipment, but compete for any type of apparatus that operating companies may desire.

Since making this purchase, contract has been made for the installation of an automanual switchboard at Ashtabula, Ohio, which will be put in operation next year. Charles H. North, president, and George C. Steele, secretary and treasurer of the North Electric Company, need no introduction to the telephone trade. James B. Hoge, who has recently been elected vice-president, is well known and is one of the best known men in the telephone field, having been prominent in the work for the past ten years, three years of that time being president of the International Independent Telephone Association. The directors of the company are all strong, well-known men in their communities.

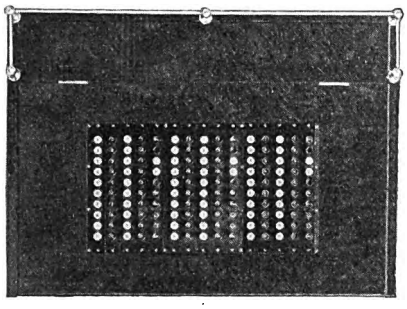
The Clement-Automanual equipment consists of an automatic switching outfit at the central office, operated by operators. The necessity for a subscriber's dial or "sender" is thus done away with, and the substation telephone is reduced to its ideal form, which is that of the ordinary standard common battery instrument used in all manual systems, but never heretofore in any automatic system. The subscriber's station, his line to the central office, and the line connections on the main frame, with their prospective devices, are absolutely the same in all standard common battery systems. The differences are within the main frame at the central office, the automanual equipment being substituted for the ordinary switchboard.

A complete automanual equipment is divided into two parts, viz., the operator's equipment, consisting of keys only, and the automatic switching apparatus.

Each operator's position is equipped with controlling keys somewhat similar to those of a typewriter. Each key set enables the operator to take and dispatch one call at a time, and becomes available for another call as soon as the first call is sent through.

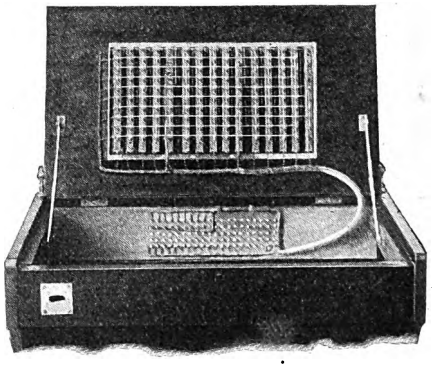
There are only "A" operators. The system does not employ "B" or trunking operators. There is no delay due to repeating numbers for another exchange, nor to selecting or ordering up idle trunks, nor to any of the numerous causes that have heretofore contributed to delay, increased the percentage of errors and added to the expense of connecting stations through different exchanges. The switch and relay equipment takes care of incoming and outgoing trunk calls without any thought on the part of the operators or subscribers. The arrangement permits of any desired scheme of numbering in a multi-office system. All of the telephones in the entire system may be numbered in one series, or, if desired, various exchange names or letters may be used. This statement also covers selective party line telephones. The exchange manager may number or letter or otherwise designate his party line subscribers in any manner he sees fit. The apparatus is adaptable to any system of designation without exception.

A subscriber calls by taking down his receiver.



Clement-Automanual, Top View.

Clement-Automanual in Operation.



Clement-Automanual, Showing Wiring.

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He is instantly connected to an idle operator. Incoming calls are distributed among the operators, and as the number of operators is increased or decreased, the distribution adjusts itself to meet the varying conditions. When only one position is in service all calls come to that position.

The operator, seeing the signal on her idle key set, takes the number and sets it up on the keys. Her work on that call is then finished. She pays no further attention to it, but if other calls are waiting she is free to attend them. Her sole function is to take numbers and set them up. If the subscriber wants a long distance or toll connection, or to make a complaint, or to ascertain a number, or to state any want whatever, the operator adheres to her function, and merely sets up the keys so as to put the subscriber through to the person or department who can satisfy his want.

A number having been set up on the keyboard, the switches commence to operate, and through successive steps, automatically taken and directed, the line corresponding to the number set up is selected and tested, and if found idle the subscriber is rung in the usual manner. If he is a party line subscriber, current of the proper frequency is selected, or the proper combination of circuits is made, so as to call him selectively. If the line is busy, the calling subscriber is automatically notified of the fact, as he is also if the wanted subscriber does not answer. Every contingency met in actual practice is provided for, and the system is so flexible that any step or function that can be performed in either a full automatic or a full manual system can be performed, according to the manufacturers' claims, more easily, more quickly, more economically, more efficiently, and with a lower percentage of error.

As soon as the switches have selected the line wanted, the particular operator's key set which was temporarily employed to handle the call, becomes disconnected, and all the operators are locked out during the continuance of the conversation between the subscribers. Absolute secrecy is thus insured.

The talking circuit, during conversation, is clean and clear, being essentially a duplicate of the standard bridged battery circuit employed in the most modern manual systems. What may be called double supervision or control is effected, whereby the calling subscriber can clear out, at any time, before the called subscriber answers; and after that the called subscriber can disconnect his own line. It is thus impossible to tie up a line either accidentally or maliciously.

When the subscribers have finished their conversation and hung up their receivers, all the connective apparatus between their lines is instantly cleared out and restored to normal condition, ready for use by other lines. This instantaneous clearing out not only enables the lines to call and be called again without delay, but effects an actual economy in apparatus and cable. This is especially noticeable in trunking between exchanges, where from five per cent to ten per cent may be saved with the same efficiency, or a corresponding increase in efficiency attained with the same cable over the best manual systems.

In making a recall the subscriber simply hangs up his receiver and immediately takes it down again, or he may depress the switch hook a moment with his finger. This clears out the existing connection, and when the hook rises it puts the line again on an idle operator, who may or may not be the same operator that made the preceding connection.

The equipment and operation of the chief operators, monitors, wire chiefs and other auxiliary desks or positions are in accordance with standard practice. There is a considerable gain in efficiency as well as economy in these positions, because of the reduced number of operators and the reduced amount of equipment required.

The design of the switches and relays, and the method of mounting them, result in a great saving of space in the switch and power room. For the operating room the space required is also greatly reduced. All the operators for a 10,000 line exchange can be accommodated in a room 25 by 30 feet, and smaller exchanges in proportion.

Where numbers are changed, telephones disconnected, or other contingencies arise which on a manual board are indicated by colored pasters or change plugs, the automanual equipment automatically provides for them with perfect certainty and no trouble.

It should be particularly noted that there are no cords or plugs in this system. The talking connections are not made through the operator's equipment, but are only initially controlled thereby, and are thereafter under the control of the subscribers themselves, the same as in a full automatic system.

All calls, in a properly handled exchange equipment of this type, should be answered instantly, and the average time consumed by the operator in taking a number wanted from the calling subscriber, repeating the number and pressing the corresponding keys is 2.9 seconds. Working continuously, therefore, each operator could handle more than 1,200 calls in an hour. Allowing for lost time, however, and for slowness of subscribers, an experienced operator, with this equipment, should handle 800 calls per hour, and an ordinary operator at least 600.

On this basis a 10,000 line exchange can be handled by from 17 to 25 operators, and smaller exchanges in the same proportion.

AUTOMANUAL ADVANTAGES.

1. From 40 per cent to 80 per cent saving in "A" operators' salaries.
2. One hundred per cent saving in "B" operators' salaries.
3. Reduced maintenance charges, due to simplified apparatus.
4. Quick, accurate service.
5. Secret service.
6. Absolute control of connections by subscribers. No interruptions during conversation.
7. Quick trunking service.
8. Operators' duties simple and easily learned. No students' board required.
9. No grounds or complicated sending devices at the subscribers' stations.
10. Any standard common battery telephone can be used.
11. Automatic ringing; saves time and labor; insures uniform ringing throughout the service; also prevents one subscriber tying up lines of another by not ringing after getting connection.
12. The operator cannot show favoritism to particular subscribers, as she never knows who originates any call. A subscriber's call may be answered by any operator in the exchange.
13. Called subscriber can release his line when called by undesirable parties by simply hanging up his receiver.
14. Expensive and special frame-work for switchboards is not needed. The operators' desks are of very simple design and can be standardized.

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15. The distribution of calls among the various operators is uniform at all times. As the load decreases, and as the operating force is reduced, the calls are distributed among the remainng operators.

16. No patrolling of the switchboard at night or on Sundays or holidays is required, all calls come to the desk or desks in service.

17. The talking circuit is clear and well balanced.

Indignant Nebraska Independents.

Editor Sound Waves:—At a recent meeting of the executive committee of the Nebraska Independent Telephone Association, held in Lincoln, the following resolution, bearing on the offer of the Western Electric Company, the main manufacturer of the Bell, was unanimously adopted:

Whereas, The Western Electric Company, subsidiary company of the American (Bell) Telephone & Telegraph Company, has persistently and unceasingly persecuted and harassed the Independent telephone interests of the country for the past twelve years by suits for alleged infringements of patents and by intimidating intending investors and subscribers by threats to bring such suits, and

Whereas, These suits have been successfully defended largely at the expense of, and by the skill and energy of the Independent manufacturers of telephone apparatus, who have in the meantime produced and perfected apparatus far superior to that made by the said Western Electric Company, and

Whereas, The said Western Electric Company, at the dictation of the American Telephone & Telegraph Company, now offers to sell its wares outright to the Independent companies at cut prices with the object (if we may believe the press reports) of getting a footing with said companies, so as to ultimately assist the American Telephone & Telegraph Company in disrupting the spirit of co-operation that exists between said companies, through their state associations and the International Association, and with the object of equipping such Independent companies as may buy from them with Bell apparatus so that they may eventually be connected with the Bell system, and that this move is only a stepping stone with that end in view; therefore, be it

Resolved, That the members of the Nebraska Independent Telephone Association are requested not to purchase nor use, nor to connect with any company that uses (Bell) telephones, switchboards or equipment made by the Western Electric Company; and, be it further

Resolved, That the secretary of this association be instructed to send a copy of this resolution to the secretary of the International Association and each of the state associations and to all of the trade papers.

R. E. Mattison, *Secretary.*

Meeting of District No. 1 Michigan.

Editor Sound Waves: An enthusiastic meeting of district number one was held at Howell, Michigan, Tuesday, October 22.

There were about twenty-five representatives present and the discussions were of a local nature entirely, with the exception of President Fischer's address relative to ad velorem taxation, in which he urged that every company interested in Independent telephony should see their respective senators and representatives and show them wherein it would work great harm to the Independent companies if either the Dusk or Kinane Bills should become law.

J. P. Boylan, superintendent of service of the Inter-State Long Distance Telephone Company, Detroit, gave a very interesting description of the new Detroit plant, the title of this paper being, "The Model Plant."

F. V. Newman, president of the Independent Telephone Managers' Association, described the work of that association and what it expected to accomplish, calling attention to the convention which is to be held at Battle Creek, Michigan, November 13th and 14th.

N. F. Wing, secretary-treasurer of the Farmers Telephone Company, Grass Lake, gave a short address in which he related his experience in the Northwest.

W. S. Vivian, secretary of the state association, called the attention of the representatives to the new rate book which is now being prepared, and urged the necessity of every office being supplied with one so that uniform rates could be prevalent, according to the Michigan Independent Telephone Traffic Association schedule.

The following officers, delegates and committees were elected: President, J. E. Hisey; secretary-treasurer Laingsburg Telephone Company, Laingsburg, Michigan; secretary, Miss I. R. Close, manager Oakland County Telephone Company, Pontiac, Michigan.

Delegates to the International Independent Telephone Association: A. B. Fishbeck, district manager, Inter-State Long Distance Telephone Company, Detroit, Mich. Alternates: C. B. King, general manager, Washtenaw Home Telephone Company, Ann Arbor, Michigan; M. A. Porter, assistant general manager, Inter-State Long Distance Telephone Company, Detroit.

District Committees consisting of one representative from each county represented in the district as follows: Wayne County, C. H. Rauch, general manager, Plymouth Telephone Company, Plymouth, Michigan; Livingston County, R. B. McPherson, director, Inter-State Long Distance Telephone Company, Detroit; Oakland County, Charles Bartlett; Clinton County, C. C. Woodruff, manager Laingsburg Telephone Company, Dewitt, Michigan; Shiawassee County, H. T. Clough, district manager, Union Telephone Company, Owosso, Michigan; Genessee County, W. H. King, manager, Union Telephone Company, Fenton, Michigan; Ingham County, F. C. Hughes, manager, Citizens Telephone Company, Lansing, Michigan; Lapeer County, Lee G. Smith, secretary, Mutual Telephone Company, Attica, Michigan.

Legislative Committee: E. C. Shields, attorney, Inter-State Long Distance Telephone Company, Howell, Michigan; F. C. Hughes, manager, Citizens Telephone Company, Lansing; W. B. Woodbury, general manager, Inter-State Long Distance Telephone Company, Detroit, Michigan; C. B. King, general manager, Washtenaw Home Telephone Company, Ann Arbor, Michigan; A. G. Griggs, secretary-treasurer, Oakland County Telephone Company, Pontiac, Michigan; Todd Kincaid, president, Union Telephone Company, Corunna, Michigan; C. C. Woodruff, manager Laingsburg Telephone Company, Dewitt, Michigan.—W. S. V.

Aluminum for Electrical Conductors.

Consul F. W. Mahin, in writing from Nottingham that the manufacture of aluminum cables as electrical conductors in place of copper has actively begun in Great Britain, adds:

The high price of copper has led to this. Aluminum, it is explained, is an efficient substitute for copper where space is not an important consideration; is lower in cost, needs fewer poles for its support, and is less affected by the atmosphere than copper. Three serious former disadvantages are now said to have been overcome—the difficulty of procuring aluminum in a reasonably pure state, of drawing it into wire, and of making satisfactory joints. The cables and wires being made in this country are covered with vulcanized bitumen treated by Paterson's method, and they are, it is claimed, not brittle at low temperatures nor unduly soft at high temperatures. which they would meet with in ordinary use.

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Chicago Grants Bell Extension

THE time has arrived for that "other" Chicago telephone company to get busy with its city franchise. The moment has come when Chicago will welcome active telephone competition.

Wednesday afternoon and night and Thursday morning, November 6 and 7, forty-four councilmen successfully battered down all of the amendments offered by a fighting minority who stood for a betterment in present service conditions.

After a day of successes for the Chicago Telephone Company its champions crowned their work by depriving the city of its only opportunity of getting added revenue beyond the 3 per cent which is allowed under the present ordinance.

As suavely as though he were addressing an invitation to the city council to dine with him, Alderman Milton J. Foreman, the leader of the majority, urged the council to strike from the ordinance its most important provision, from the city's standpoint—that allowing the municipality to collect all moneys realized by the telephone concern over and above the amount necessary to pay 10 per cent dividends on its capital stock.

During the long-protracted session, the contest brought forth some ugly retorts from the minority. In the matter of rates Alderman Fulton showed by figures that the rates proposed were extortionate, and Alderman Dever came as near to making graft charges as the English language would permit, and not make them.

The majority sat absolutely silent under the lashing, after Alderman Young had made a perfunctory statement that the rates were based on the finding of the expert commission and had quoted rates of New York, Philadelphia, Boston, Baltimore and other places. Alderman Dever dared the orators among them to answer, but they just voted, except Alderman Foreman, who, in explaining his vote, said all he cared for was publicity and the right of the city to fix rates hereafter, and Alderman Badenoch, who questioned the good faith of Levy Mayer in his proposals for the Illinois Manufacturers' Company.

Alderman Uhlir led the attack in support of his own amendment to make the unlimited rate $90 a year.

"I know," he said with vicious sarcasm, "that you are all friends of the poor telephone users and that you will agree to this amendment without argument. You are giving the company a twenty-year extension, and the patrons nothing. If the courts had not held that $125 is a reasonable rate it would not be in now. A higher rate would exist. You have argued you are more interested in the users than in the telephone company, and now we'll see if you are sincere."

Aldermen Hey and Foell then explained that the earnings of the company are much higher than supposed, but are hidden in "yellow dog" funds. The latter analyzed the findings of the expert commission and showed that by them the company would make a big profit at a $90 rate.

"When the cat is dead, what is the use of filling him full of bullets?" said Alderman Fisher. "A $75 rate would make the company a big paying concern. If we are here in the interest of the company, let's not be niggardly, but give it a rate of $175. If we are here in the interest of the people, let's not beat them out of 40 per cent more than the company is entitled to for the service."

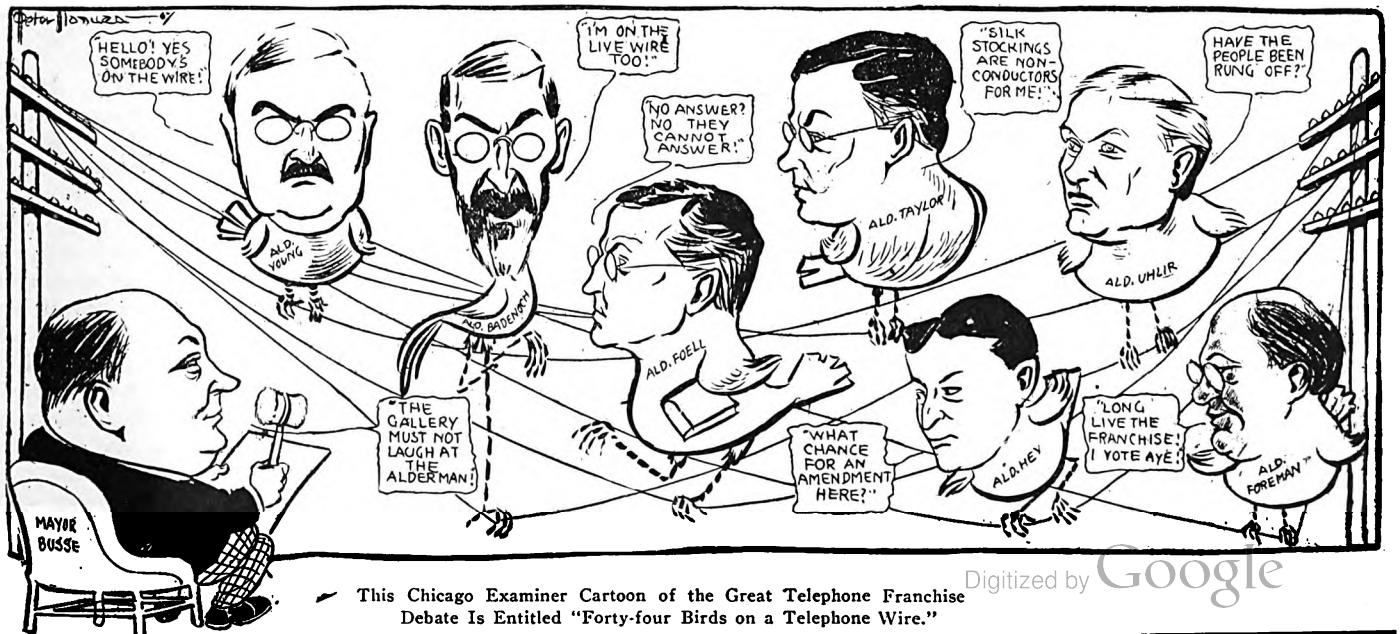
Alderman Fulton then broke loose with figures. He is a new member and nothing much had been heard from him previously, but he made a reputation yesterday. He had the Gosselin report and the commission's report on his desk and he used the figures mercilessly

"In 1906 the company paid 10 per cent dividend on a capitalization of $14,000,000, $1,000,000 of which is admittedly water, and still had a surplus of $270,000," he said. "It paid that dividend after raising the depreciation account from 5 per cent to 8.1 per cent. Mr. Gosselin, city auditor, places the profit at from 17 to 18 per cent.

"The company says its plant is actually worth $18,000,000 or $19,000,000. I believe it is and who paid for it? It put in but $13,000,000 and we paid the rest. It is taking a course to force two telephone systems here, if it has not already secured the tunnel, as it is rumored.

"It speaks of the concessions it has made. What are they? Well, one is mileage for unlimited service. All told, that amounted to $12,580 in 1906. A big concession, isn't it?

"Another is the abolition of the ten-party line. That is no concession that affects the receipts of the company


HELLO! YES SOMEBODY'S ON THE WIRE!
ALD. YOUNG
"I'M ON THE LIVE WIRE TOO!"
ALD. BADENOCH
"NO ANSWER? NO THEY CANNOT ANSWER!"
ALD. FOELL
"SILK STOCKINGS ARE NON-CONDUCTORS FOR ME!"
ALD. TAYLOR
HAVE THE PEOPLE BEEN RUNG OFF?"
ALD. UHLIR
"THE GALLERY MUST NOT LAUGH AT THE ALDERMAN!"
MAYOR BUSSE
"WHAT CHANCE FOR AN AMENDMENT HERE?"
ALD. HEY
"LONG LIVE THE FRANCHISE! I VOTE AYE!"
ALD. FOREMAN

This Chicago Examiner Cartoon of the Great Telephone Franchise Debate Is Entitled "Forty-four Birds on a Telephone Wire."

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to amount to anything. A third is that the rate of public telephones is cut in two for suburban service. That costs them just $17,000. What percentage is that of the annual income of $12,000,000?

"Then there is the reduction on extension telephones. It is a charge that should never be made, and the 'concession' costs less than $100,000 a year. That's all you get. Do you see anything there to cut into the enormous earning power of this company?

"But the committee was ready to give the company anything it asked and would have given them an all-measured service but for the president of this council. After all the years of robbery and waiting to come face to face and arm to arm with this company, this is all we get, an ordinance under which the company can earn 17 to 18 per cent a year. We don't owe it anything, but it owes us everything, but it comes in here as though it had the right to dictate."

We only show by the foregoing that Chicago has a few telephone men in its council chamber. For a few days it was believed that Mayor Busse would intercede for the city and veto the measure, but the mayor is first a politician, second a politician and third a politician. He has a long term ahead of him and he believes that the people will forget or that he will have his machine well enough in hand to beat the people from the politician's point of view.

At this juncture it may be interesting to have a look-in upon this concern. In 1892 the Chicago Telephone Company had a paid up capital of $2,000,000. Since that time the stockholders have put in 11,000,000 new cash and have taken out in dividends substantially $12,260,000. In addition they have left, according to their last official statement, a plant valued at $16,706,426 and other assets, bringing the amount up to $19,791,436.

Against this they have debts of $4,718,097, leaving, according to the company's own figures, assets of $15,073,339. After receiving since 1892 $12,260,000 in actual cash against a paid in capital of $13,000,000 the company still has $15,073,339, or 115 per cent, to distribute to its shareholders on the money paid into the business by them.

The outstanding capital at this time is $14,000,000. But in April, 1900, there was distributed a stock dividend of $1,000,000, so that the actual new money invested amounts to but $13,000,000. The dividends received on this $1,000,000 of water since its issue have amounted to 74 per cent, or $740,000.

The dividend record of the company has been a surpassingly good one, as the actual figures taken from payments will show. The company began business as a consolidated corporation on January 14, 1881, with a capital stock of $500,000. It at once began paying good dividends, for it was a company composed of two previously warring ones, and when the competition was over the profits were large. Records available outside those of the company's office show that in 1889, or eight years after the company was formed, dividends were being paid at the rate of 2½ per cent monthly, or 30 per cent a year. On January 17, 1883, or two years after the company was organized, the authorized capital stock was increased to $2,000,000. There was no change in this capital for nine years, or until January 22, 1892, when it was increased to $5,000,000. In 1889 the company was paying 30 per cent a year, and prior to that date it is not unreasonable to assume that the dividends averaged between 20 per cent and 25 per cent.

John Barton Payne, who represented the company in a legal way, has announced that the highest dividend paid was 36 per cent a year. This was prior to 1889, so that the distributions between 1881 and 1889 must have been exceedingly large. During those years the company gave out but meager information concerning its affairs, and comment at the time was that the stockholders were satisfied with such a policy. The comment seems reasonable enough.

From the subjoined table, taken from authoritative sources, any one may figure the dividend returns in cash, based on the capital issues:

	Dividend Record.	Market value of stock—High.	Low.
1889	30%	305	300
1890	30%	305	300
1891	24%	250	221
1892	20¾%	230	210
1893	12¼%	210	190
1894	12%	187	150
1895	12%	180	150
1896	12%	175	157
1897	12%	201	165
1898	12%	240	198
1899	12%	230	195
1900	12%	245	175
1901	12%	276	218
1902	10%	230	160
1903	10%	160	114
1904	10%	147½	115
1905	10%	143½	125
1906	10%	139	101
1907	...	134½	107
Total	263%		

The foregoing dividends indicate that on the $2,000,000 capital stock there was paid between 1889 and 1906 263 per cent, or $5,260,000, nearly three times the amount of that investment.

From time to time new stock issues gave the shareholders rights of large value. Altogether, beginning with 1892, the value of these rights, being profits on new stock, aggregated 77 per cent. The American Telephone & Telegraph Company as a majority holder of the stock of the Chicago Telephone Company has secured something over 51 per cent of the profits which have been divided.

News from the Northwest.

It is given out that the Home Telephone Company, Seattle, Wash., will enter into a contract with the Interstate Telephone Company for local and long distance connections, thus furnishing lively competition for the Pacific Telephone & Telegraph Company. The Interstate lines now reach a large number of points in the Spokane country, an area of 150,000 square miles in eastern Washington, northern Idaho, northeastern Oregon, southeastern British Columbia and western Montana, and as soon as the lines now under construction and projected are completed the company will cover the bulk of the Pacific's field in this inland empire of the northwest.

The Home Company has long distance connections between Everett, Wash., and every town and city in Oregon as far as Portland. The line will be extended from Everett to Spokane, but the company contemplates no incursion into the local field beyond the business in Spokane itself. For connections in the Spokane country it will depend upon its traffic agreement with the Interstate Company. The Home Company's long distance lines will permit the Interstate Company to reach Puget Sound and Pacific coast points, while the lines of the Interstate Company will give the Home Company entrance into the Coeur d'Alene mining district and the Palouse and Big Bend wheat belts, which could only be reached at large expense by the Home Company if it were compelled to string its own wires, into the territory.

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Concerning the Distributing Portion of the Telephone Plant

Sherburne D. Levings

MUCH has already been said regarding this subject, but each new dissertation seems to bring forth some new ideas or figures. This article will treat first costs, maintenance and depreciation of the distributing portion of the telephone plant.

It has been discovered, in the majority of cases at too late a date, that the earning capacity of a plant is not of sufficient magnitude to allow the disbursement of both dividends and a sinking fund for plant displacement and extensions, together with the maintenance charges. Before setting a rate for a telephone business let us see what conditions are to be encountered other than the mere raising of money for the original installation. The chief drags upon the capital of a telephone company are, first, operating expenses; second, maintenance fund; third, depreciation fund, and fourth, extension fund. The first two, that of operating expenses and maintenance, are usually well cared for with a sufficient balance for dividends. The last two, however, are more often seriously neglected, or more probably underestimated.

Assuming that the rate set for telephone users is being compiled and that the first two items are accounted for with a safe margin. Now comes the depreciation charge. Every year that the telephone plant will be in service will see the loss of a certain sum of money due to the wearing out of the apparatus. The rate at which the apparatus depreciates is a very variable quantity determined by the particular class of construction and material. The following rates of depreciation are proven by time to be safe for calculating purposes.

	Per Cent.	Life.	Recovery Value.
Main underground conduit leads	3	33	0
Subsidiary underground conduit leads	7	14	0
Main underground cable leads	3½	16½	42%
Subsidiary underground cable leads	5	12	42%
Poles equipped	12	8½	0
Aerial cable	6	11	34%
Aerial strand	8	12½	0
Cable terminals (aerial)	8	12½	0
Open wire, copper	2	15	70%
Twisted pair wire, copper	12	7½	12½%

In arriving at these charges the factor of recovery value has been considered, so that in the case of a plant having a recovery value the number of years life times the per cent depreciation does not equal 100 per cent, but that figure plus the per cent value of recovery, which is the percentage of the original cost, will in all cases approximate 100 per cent.

Now that the rate of depreciation has been determined from actual demonstration, there are three more items which added to the depreciation figure gives the annual charge on each portion of the plant, or, in other words, the amount of money that will have to be set aside each year for the renewal of the plant. The three charges above referred to are maintenance, interest and taxes. The maintenance charge varies, as in the case of the depreciation figure on the portion of the plant in question, the interest charge is usually figured at 5 per cent and the taxes at ½ per cent. It will be clear how the taxes and maintenance figures are obtained, but perhaps the interest charge is not so apparent. It is evident that the money invested in the plant is earning an interest, but the earning capacity is decreasing in direct ratio to the life of the plant. On the other hand, if this money had not been spent, but put out in good collateral, it would earn 5 per cent throughout the use of the money in this manner. One hundred dollars invested in the general order of banking investments will earn 5 per cent, but that same one hundred dollars invested in certain portions of the plant will not perhaps earn 5 per cent. So it becomes necessary to account for the actual earning power of the money involved in the plant, in the annual charge figure. This has been assumed in most cases to be 5 per cent. Now that the four figures making up the annual charge have been determined, it will become evident that by adding the four figures for each portion of the plant will give the annual charge on that portion. For instance, the annual charge on conduit plant would involve 3 per cent for depreciation, 5 per cent for maintenance, 5 per cent for interest and 5 per cent for taxes, or a total annual charge of 9 per cent.

This means that if $10,000 was originally invested in the conduit plant that at the end of the first year the actual value of the conduit plant has been reduced $900 and the value becomes $9,100. This also means that the $900 will have to be set aside for renewal. At this rate it becomes evident that at the end of the tenth year enough money has been set aside to rebuild the original plant, providing that the base cost figures have remained the same. But as the cost of building telephone plants is assumed to increase, together with the fact that it requires money to remove the old plant displaced, the ten year period will not accumulate quite enough money to rebuild the plant. But assuming that the needed sum can be obtained in fifteen years at the ten year rate of annual charge, then all moneys earned after fifteen years till the period of life of the plant is a net earning. Therefore it appears that out of these net earnings considerable extensions can be added to the plant if justifiable. Of course, it is not to be presumed that extensions will not be made during the ten year period, but this money will be taken out of the annual charge fund and replaced from the net earnings as time goes on.

As stated previously, the rates set for services must be sufficient to care for all of the annual charge funds on the total plant and to make possible the payment of satisfactory dividends after operating expenses have been paid. Before setting rates for the plant, the immediate possibilities for subscribers divided into three groups, business, residence, private privileges, and included in that the P. B. X. earnings, should be known. Then a plant estimate should be made for the present plant to be built, giving in detail the portions of the investment allotted to each section of the plant, as conduit, cable, etc. After these figures have been obtained an estimate can accurately be made in operating expenses. This added to the total annual charge in the physical plant plus city compensation, if any, will give the net expenditures per year. Already knowing the total investment, the desired earning capacity can be used to find the amount of money to be used as dividends. This money, plus the net expenditures, can then be found, and the rates made to accrue this total. There is a great latitude of earning ca-

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pacity for telephone plants, some running as low as 5 per cent to an actual deficit and some as high as 18 per cent. Somewhere between 10 and 15 per cent is thought by the majority to be a fair figure. It is to be remembered that there are other conditions governing the per cent of interest on the invested capital, but these items relate to the conditions of the town in which the plant is to be built. It must therefore be remembered that if the standing of the town is not sufficient to support telephone service at rates conducive to a dividend of 10 to 15 per cent that nothing can be done to the telephone plant to make up the difference. The incorporators must be satisfied with a smaller earning power or relinquish the project.

In line with this subject there are a number of other things that should be considered in building the telephone plant to give the greatest earning power. Of great importance, the first cost is to be carefully considered and made as low as possible, but in a great many cases the original cost of a plant because it is lower than another of the same size leads to the fallacious belief that the earning power is greater. Let us consider this phase of the matter a moment: Suppose that in the case of this first plant mentioned, the lower in first cost, that 300 telephones are carried down a main lead on a pole line bearing one 400-pair cable. Let us assume for demonstration purposes that the pole line is one mile long and that the total cost inclusive of cable is $6,000. (This figure is only approximate and extremely rough.) Supposing that this same 400-pair cable be carried in conduit for the same distance, the cost would be $6,600 proportioning the cost of one duct from the cross section, which in most cases will never be less than two ducts and more often three. Now, as explained before, the annual charge on underground conduit is 9 per cent, which in this case equals $93. The annual charge on underground cable (main) equals 10 per cent, or in this case $557. $93 plus $557 equals $650, the total annual charge. Now the annual charge on the 400-pair cable carried aerially is 13.5 per cent, or in this case $748. The annual charge on the pole line is $88, or a total annual charge of $836. So it becomes evident that for an expenditure originally of the differences between the lower and the higher figure, namely $600, a saving in annual charge of $186 is made. The pole line is not good for more than fifteen years in most cases and the conduit line is good for from thirty to fifty years.

These factors should always be considered in the building of a telephone plant, and it is absolutely certain to be profitable if the annual charges on the different kinds of construction are thoroughly worked out. Many organizers throw up their hands in dismay, when told that a plant will cost, say $300,000, because it is $50,000 more than they had expected at their outside estimate. When told that the same plant can be built for $200,000 another way, it is hard for them to see into the future a distance equal to $100,000. However, the man who sees the $100,000 mark in the future and expends the money in the building of a low annual charge plant will be living on dividends while the other fellow has spent his $100,000 and double on rebuilding his plant. Let those, therefore, who are considering the telephone investment and contemplating building a plant be sure they are spending the money in the right direction, and if they are not able to work out the details, to trust it to an engineer who they can be sure will show them in black and white just what the possibilities are in the present and, what is more valuable, the future. Too many lose sight of the fact that in twenty years the money they are now spending will either be all eaten up in annual charges on a plant that necessitates great charges, or they will be reaping a financial reward for their insight in spending a few thousand more at the start.

Michigan District Meeting.

Editor SOUND WAVES: At a meeting of district number two, Michigan Independent Telephone Association, which was held in Adrian, Mich., October 23d, there were about forty members present.

Outside the regular program there was a very interesting discussion in regard to the Independent companies in the district having Bell connections, and it seemed to be the sense of the meeting that all such connections should be severed at the earliest possible moment.

E. B. Fisher, president of the state association, gave a very interesting and instructive address on taxation. J. P. Boylan, superintendent of service of the Home Telephone Company, Detroit, gave a talk on the model plant. N. F. Wing, secretary-treasurer of the Farmers' Telephone Company, Grass Lake, gave an address on competition. W. S. Vivian, secretary of the state association, talked on uniformity of rates.

R. C. Smith, secretary-treasurer of the Homer Telephone Company, was re-elected president of the district for the ensuing year, and C. G. Fitzsimmons, general manager of the Reading Central Telephone Company, was elected secretary for the ensuing year.

The following executive committee was elected: H. H. Taylor, Marshall; H. Baldwin, Leslie; C. R. Kehoe, Jackson; C. B. King, Ann Arbor; W. O. Hunt, Adrian; C. G. Sherk, Litchfield; J. Babcock, Quincy; J. Rientz, Blissfield.

The following legislative committee, to co-operate with the state association on all matters of legislation, was also elected: A. A. Burch, Battle Creek; C. B. King, Ann Arbor; F. W. Gradolph, Dundee; W. O. Hunt, Adrian; C. G. Sherk, Litchfield; F. M. Howard, Burr Oak; N. F. Wing, Grass Lake.

A partial list of those in attendance: L. Smith, Deerfield; E. Daykin, Britton; N. F. Wing, Grass Lake; George L. Ford and C. L. Braucher, Toledo, Ohio; John Rent, Blissfield; L. A. Kennedy, A. Combs, D. H. Osgood and N. L. Gignac, Morenci; E. B. Lee, Weston; C. L. Tufts, Sand Creek; J. P. Boylan, Detroit; H. R. Staily and J. W. Ball, Addison; John Babcock, Quincy; F. M. Howard, Burr Oak; C. L. Fowler, Holloway; W. J. Helm, Britton; C. G. Fitzsimmons, Reading; W. W. King, Townley; G. H. Osterhout, Britton; W. O. Hunt, Adrian; W. S. Vivian and E. B. Fisher, Grand Rapids; R. C. Smith, Homer; C. G. Sherk, Litchfield; F. W. Gradolph, Dundee, and C. R. Kehoe, Jackson.

A Dog Line at Pekin.

The Citizens' Telephone Company, Pekin, Illinois, has introduced a "dog line" as an auxiliary to its long distance service. The posters announcing this bit of enterprise illustrate a "busy line." The picture shows a smiling mother and her litter of seven thrifty puppies in a wild scramble for their dinner.

In a letter from General Manager Glass he points out that there are a couple of "loose connections" on the "line," but that his engineers have discovered a method to locate the "shorts." To test for a short on the dog line use the formula: X equals square root of mean square. Upon finding X (measured in dog feet), count the feet upon succeeding dogs until the X number is found. The result will indicate the short-circuited dog.

If you care to know how this company reaches 11,400 subscribers over the dog line, ask for literature.

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An Experience of Inflation

Being an Excerpt from the Prophetic Address Before the Banquet of the Last International Independent Telephone Convention

By T. Harvey Ferris

ABOUT seven years ago I went into the telephone business in New York state, and after threshing around a little while locally, I got ambitious. I got a few fellows with me, and we started out on what I thought were three very proper and laudable ambitions. In the first place, we proposed to build the whole of New York state. In the second place, we calculated to standardize accounting and equipment—a thing about which I had heard a great deal at conventions. In the third place, it was my humble intention to make some money. I thought that was all very proper. Having these things in mind, we bought the next plant to us, and then we bought the next plant to that and we kept on until by and by we were in about the same condition as the old farmer, who kept buying the land next to him, and the land next to him, until finally a fellow came along and said, "What are you trying to do, John, buy up the whole county?" He said, "No; all I want is just what 'jines' me." This is all we wanted—just what "jined" us, and we kept buying and buying and pretty soon we had pretty near all that joined us and we got down to the edge of the state, and then we were like the man who got drunk. The fellow got drunk one day and jumped on a train and went down to a town a couple of miles below his place, got off and didn't see anybody around but the baggageman. He walked up to him and said, "I can lick anybody in this whole town." The baggageman looked him over, saw that he was drunk and turned around and walked away. Pretty soon the fellow walked over to him again, and said, "See here, I can lick anybody in this whole county." The baggageman again looked him over, concluded not to get angry, and turned around and walked away from him. In a few moments the man walked over to him and said, "Say, I can lick anybody in this whole state." With that the baggageman turned around, knocked him down a couple of times and threw him off the platform into the cinders. The fellow got up, brushed off the cinders and said, "The trouble with me is that I bit off too much territory." The trouble with us was we bit off a little too much territory.

But we had a further idea in connection with our other ideas. We had incidentally as we went along put in a little water. As a friend said, we were bounded on the west by Niagara Falls, on the north by the Saint Lawrence river, and on the east by the Atlantic ocean, and we took pretty much all of it. Now I don't know why we did that. I suppose it was on the general theory that the Lord would provide; but after about three years' experience in waiting for the Lord to provide for watered stocks in Rochester, I came to the conclusion that Rochester was a good deal like Chicago and New York. I suppose you have heard the story about the man who went to the bookseller and asked for a copy of "Seekers after God" by Canon Farrer. The bookseller did not have it, but telegraphed his house in Chicago for it. To his dismay he received the reply: "No seekers after God in Chicago—try St. Louis."

My notion is that we expected the Lord to provide the dividends. They were about the thinnest things I ever saw. As a matter of fact, they did not materialize at all after the first six months, and we paid those out of the construction profits.

After seven years' experience on the inside of the telephone business and two years' on the outside of it, I bring two messages from the Empire State. There are two things that the telephone business in New York state has taught us in the last six months.

The first one of these is this: There is nothing in the Independent telephone business which will of itself warrant the continual watering of stock. There comes a time when you have got to stop, and my judgment is that now is the time when we all ought to take a day off and think it over. When you stop to think of it and recall that the United States Independent Telephone Company sold its bonds at 80 and was capitalized on a stock and bond basis of thirty-two millions, with less than five millions of actual investment, you can easily see the reason for its downfall. Now that sort of thing must stop, and I want to call your attention to it right now, with this idea in view. It has not only got to stop in the telephone business; it must stop in the railroad business, in the gas business, in the electric business, and with all public utility corporations. The time has come when the people of the United States will not submit to any public service corporation taking 30 per cent profit and then declare a 100 per cent stock dividend in order that it may only appear 15 per cent on the books. The people of this country are going to demand that the people themselves share the profit.

If the time comes when your telephone company is making 30 per cent you must not double your capital stock, but you must reduce your rate. If the time comes when you are only making 5 per cent there is nothing under heaven, if you take the public into your confidence, to prevent your raising the rate. It is a business proposition.

There is no lodestone in the word "Independent" and there is no lodestone in the word "Bell." You are face to face with a cold blooded business proposition. The people of the country will give you 15 or 20 per cent. They won't give you 50, and they won't require you to work for five. That is the first thing which the United States Independent Telephone Company has taught us in New York state. The people "are from Missouri" in these days and they want to know. You must take them into your confidence. You must show them fairly and frankly what you are making and the day you do that, that day you stand firmly entrenched back of the public opinion which is necessary to your success.

That may seem to some of you who are constructing and promoting plants a hard proposition, but if you follow it out and continue the warfare against the Bell, you are certain to win, because that company can't show down. It has watered and watered until it has reached the position where it can not pay a reasonable dividend on its present capitalization. If the public would demand that it pay dividends upon the cost of construction only, its rates will be cut in half and it can not live.

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One other suggestion from our experience: Stand-

ardization of equipment is almost necessary. It is one of the most important things you can have. Standardization of accounting is important. A central point of control is very important. But local interest and local domination is vital. The day you get away from your local board of directors, the day you leave your local point, that day spells ruin, and eventually you become waterlogged, like the Bell telephone companies themselves. Always stay with your local people, and if you do, and treat the public fairly and honestly and openly, I tell you as an outsider—for two years I have not been actively engaged in the telephone business—that you are just as certain to win your fight against the Bell Telephone Company as the sun is to rise.

Those are the things which Rochester found out. It cost some of us some money to find them out, but they are the two things that, afer all, in my judgment, are absolutely essential for telephone men to know.

If any of you are waterlogged today, get rid of the water. Go through the shrinking process; have it over and get down to earth. The public of this country will stand for a fair and honest profit and no more.

And don't get away from the people.

No city in the United States is big enough to finance the telephone business of the United States. You have said today and it was with pride I heard you, that you had three hundred millions of dollars invested in the telephone business. It will take three billions to build the whole United States, and neither Boston nor New York nor Chicago alone can provide it. Your secret is to let each town build its own, and that money you will get if you stick to your local control.

A Telephone Lineman's By-Product.

Editor SOUND WAVES: While I was down in the country visiting, a few weeks ago, I ran across a genius in the telephone business. This man's name is Bill Adams and he is trouble-shooter, lineman, etc., on a rural system. Up to a year ago Bill shot trouble from a bicycle because the company couldn't or wouldn't furnish him a horse. A year ago last spring, a horse trader down where Bill makes his home got "stuck" with a balky old mare and after trying in vain to dispose of her he told Bill, for whom he had a great friendship, that he would give him the mare and if Bill could make the raise of a vehicle he would have a good outfit. The horse-trader told Bill that the old mare was balky and might take him ten miles from nowhere and then refuse to move. Bill is an optimist, and he said he would take chances. So he skirmished around a good while and got a buggy from one man and a harness from another, and one Saturday afternoon he started out on a hurry call about fifteen miles out of town.

The old mare went along very sedately until they were just about half way to their destination when she laid aside all pretense to industry and refused to move another inch.

Bill got out and argued with her.

Then he got down on his knees to pray to her, but she only laid back her ears and grinned and refused to move.

Then he tried to kick her, but she was on to all the tricks that are used to start a balky horse and Bill nearly got his "lights" knocked out.

Then he sat down by the side of the rig and started to cuss long and fervently. Finally he calmed down and got his wits to work. He delved into his repair box and took out an old 5-bar magneto generator, that kind that are guaranteed to "ring through." He put this on the seat of the rig and then he took two pieces of copper wire and skinned the ends and fastened them on the opposite poles of the generator. One he ran along the harness and down the bridle and wound the bare end around the bit very closely. The other wire he ran to the crupper and wound the bare end of it around that. The old mare turned to one side and then the other to see if she could find out what was going on, and she had a glint in her eye that seemed to say that no new tricks would have any effect on her. She still stood there, so Bill jumped on the seat of the rig and grabbed the reins in one hand and the crank of the generator in the other. "Giddup," he shouted, but the old mare did not move. So he gave the crank about twenty-eight turns to the right as though he was trying to raise a farmer out of bed at 2 o'clock in the morning about fifteen miles away. The result was all that one could desire. With Longfellow, a spectator might have said:

"She starts, she moves,
She seems to feel
The thrill of life
Along her keel."

That's exactly what happened to the old mare, she started off on a dead run and before Bill could halt he was eighteen miles past where he intended to stop. She might have been going yet if Bill had not remembered the old homeopathic axiom, "like cures like." So he gave the generator a few twists and the old mare stopped. That was the beginning of the end. He turned her around, turned the crank and stopped where he was to shoot the trouble.

He is still using the old mare, but he has to use the "calling circuit" in order to start and stop her. He has formed a partnership with the horse-trader, and is engaged a good deal of the time in breaking in balky horses. He uses this same device on them all, and makes quite a neat sum for his services and also some on the side by selling generators. Every machine that Bill sells he guarantees will make any balky horse start or stop.

Bill is very modest about his achievement, and won't admit that he has made a lot of money out of it. He says he has one more idea up his sleeve. He will submit his scheme to the telephone journal publishers. He thinks it would prove a great circulation stimulator. He says he has never tried it on any animal where it failed to stimulate circulation, and as soon as he can get to it he is coming to Chicago and try it on some telephone journal publisher. I gave him your name.—WOODY.

W. W. Hindman, secretary of the Home Telephone Company, of which he is also a director, gave out this statement a few days ago:

"Spokane will have one of the model automatic telephone systems of the country. The construction will be the latest and it is aimed to make the plant the best and most complete in the world. The plant in Spokane will cost about double the amount the management promised the people would be paid out to install the local exchange. In other words, the cost of the equipment will represent an outlay of $1,400,000. The plant will be completed and in operation in January, 1908, and indications are that we shall begin business here with at least 8,000 subscribers. We are making no special efforts to secure subscribers now, as experience has shown us that people will apply for instruments as rapidly as they can be accommodated after the exchange is opened and the advantages of a modern, up-to-date automatic system are shown."

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Relation of the Rural Telephone to the Farmer

By Charles H. Schweizer

NO community liveth unto itself in this age of progress and development. Our wants are so many and so varied; our inability to supply these of ourselves so apparent; that we are dependent upon others for the satisfaction of our needs. This has made it all important that every section of our great land should be in almost instant touch with not only every other section but with the world at large. The means of communication have multiplied so rapidly that this is now almost an accomplished fact. The development of our transportation facilities, the building of great transcontinental railroad lines, the extension of existing systems, until nearly every hamlet is supplied with railroad advantages was the first great factor in bringing about this result.

The improvement of the waterways, the natural highways of the nation made further progress toward the same end. The telegraph improved the situation and made it possible to flash the world's intelligence across the country in the twinkling of an eye and linked together nearly every village in the land. The long distance telephone accomplished still greater results and annihilated distances by bringing people far removed from each other in almost personal contact, through personal conversation. And now it remains for the rural telephone to fill in the waste places, and round out and make the situation complete, for when every farm house in the land is supplied with a telephone, connecting it with the rural exchanges, and through them with the uttermost parts of the counry through long distance lines, the ideal will have been accomplished. The rural telephone is no longer an experiment. It has ceased to be a luxury. It is now a household necessity. It is now as important an accessory of the farm as a reaper, binder, cream separator or other modern piece of machinery. No inhabitant of the farm can afford from a material point of view alone to be without it, to say nothing of the comfort and sense of security which comes with its possession.

And what a transformation it has wrought in the life of the rural communities. How changed the situation of the American farmer as compared with but a few years ago. Time was when life upon the farm meant exile. Even in thickly settled farming communities, the inhabitants necessarily lived some distance apart. They were practically shut off from the outside world. The great events of the world's movements had passed into history ere they were even apprised of what was really going on. Communication with their immediate neighbors was only occasional and dependent in the main upon social, church or political gatherings, which were usually few and far between. There were, of course, the visits to the village store on market days, to replenish the family larder, get the mail and exchange items of local news and gossip. These were real moments of great interest, surpassed only by the rare visits to the neighboring great city to attend a circus or the county fair. The newspapers and the exchange of letters with distant relatives kept them only slightly in touch with the great world beyond their rural environment. Life on the farm, because of its isolation, was something to be dreaded by the rising generation, rather than to be welcomed and looked forward to with pleasure, as the ideal existence close to nature.

How wonderful the change really is, can only be appreciated by taking time to look back and note the condition of things a few years ago, and compare them with the situation today.

First came the rural mail delivery with its blessings of a daily mail. What a relief to be able to count on the appearance of this regular visitor. In rain or sunshine, in snow or hail, the postman makes his daily round constantly reminding the farmer that he is one of the important factors in the life of the nation and keeping him in touch with the world about him. And what an advantage the rural mail delivery was to him; what an economy in time and money! How many trips to the village store or to the neighboring city were now made unnecessary. An order sent one day to supply a household want brought the required articles to his door on the morrow. made the daily newspaper a possibility on the farm wherein the farmer might read the market reports from day to day and keep himself informed concerning the great happenings of the world, almost as quickly as the residents of the city.

The rural mail delivery was but the forerunner of the rural telephone. The former emancipated the farmer to a limited extent from his isolation on the farm; the rural telephone takes advantage of the door or opportunity opened by the rural mail delivery, and offers to strike the shackles entirely from his restricted life. By its magic influence the farmer is brought into instant and constant touch with his fellows and with the world about him. It stands as his ready servant obedient to his will, to supply his every need and fill his every want. A social chat with this neighbor, a friendly conversation or the communication of an item of family news to nearer relatives and friends, a business transaction with the village merchant, or a bit of world important news over the wire are his without stepping from his door. By its means he arranges with his neighbors for a raising bee, or for taking care of his next day's threshing, calls the village store and orders his supplies for the house, postpones a business engagement because of some unforeseen event making it impossible for him to be present, saving himself the embarrassment of an unfulfilled engagement and the other party the loss of time in keeeping his to no purpose. In a thousand ways the telephone enters into the life on the farm in a practical way. In case of a breakdown on the harvest field, when the immediate repair of the broken machinery is a matter of considerable moment, the telephone comes to the rescue, gives the order to the implement house in an instant, and at once the defective part is on its way to save the farmer from great loss and greater annoyance. He keeps in touch from day to day and from hour to hour, with the state of the market, and closes business deals of vast importance and consequence in reliance upon authentic information which he receives. Many times the cost of the annual rental may be saved to him by being advised of the predictions of the weather bureau, which are available to the subscribers on rural lines, since storms and frosts may be guarded against.

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But in times of need and danger what a blessing the telephone really is. Anxiety and distress of mind, which formerly attended the hasty trip to the family doctor miles away, in cases of sudden illness, now gives way to peace of mind and a sense of security when the telephone advises that the physician is on his way to relieve the pain and distress of the sick one. From every point of view the telephone must henceforth be reckoned with as one of the things the farmer cannot and ought not dispense with.

But the rural telephone plays a larger part than its influence upon the farmer himself and his life upon the farm. Every rural telephone line enlarges the life of the community which has access by means of it to the subscribers on the line. The patrons of the village or city exchange are given a wider field for operation, in the business, social and political field, and I believe that its influence is going to be felt in still another direction. We have all noticed, before the advent of the rural telephone, that the farm seemed to have lost its attraction for the youth of our land. The tendency was toward the centers of population, the great cities, which seemed to attract the youths from the farms, often to their undoing, as some great light lures moths to destruction. The rural telephone has thrown out the life line to the farming communities. It has made life upon the farm sweeter, happier, more comfortable and more bearable, and its effect will be to repress the tendency of drifting from the farms to the great centers of population and activity in the large cities.

That the rural communities realize the importance of the rural telephone is apparent from the tremendous increase in the number of rural telephones in the past few years. Everywhere rural lines are being run bringing thousands upon thousands within the realm of its beneficial influence. The demand for rural telephones is taxing the financial ability of the local telephone companies to furnish them, and where these cannot supply the demand, the farmers are themselves organizing mutual companies for the construction of farm lines. That a great opportunity presents itself to the Independent companies in the direction of developing the farm line business must be apparent to the most casual observer. The Bell Company has long been unable to meet even the competition of the Independents in the cities. It has already abandoned the field to the Independents in many places and is now expending all its energy toward saving its long distance business by making alliances and connections with the Independents, which a few years ago it would have scorned with contempt. The companies which control the farm lines and the farm line connections are going to have a tremendous advantage over the competitor which cannot offer connections with the rural communities. It seems wise therefore that the Independents should make the most of this opportunity to take and hold the farm line business and make themselves secure in the territory in which they operate.

As already stated, the demand for rural telephones is so great that it is difficult to supply the demand. This has given rise to many small local mutual farmers lines. As a rule lines built upon the mutual basis plan are poorly and cheaply constructed. The promoters are necessarily without experience in this line of endeavor and do not appreciate the importance of good construction and constant supervision. A word of warning and counsel to all who would engage in the construction of such lines would seem appropriate here. Supply houses are too frequently responsible for the construction and maintenance of mutual lines. Of course, when the supply house has sold the equipment, its object has been attained no matter what the consequences may be with the purchasers. Beginners in the telephone business learn that the telephone business is a real business, and can only be successful when engaged in on right principles and carried on by persons who understand. Mutual farm line companies, with rare exceptions run the same course, and have a brief existence, ending with the surrender or abandonment of their lines to companies organized for the proper conduct of the business, after learning that good and satisfactory service can only be had by good construction and constant supervision, which is almost impossible of attainment in mutual companies. In the end it will be found that a telephone is only a source of annoyance and discontent unless it can be relied upon at all times and in every stress and that it is cheaper and more satisfactory to get service from a properly organized telephone company than to rely on mutual organizations.

The rural telephone has great possibilities for the future. The field is just beginning to be developed. The day is not far distant when every farm house in every community will have its telephone, and when this has been accomplished, the millenium will not quite have been reached, but the farmer will be the happiest and most contented man in the community, and the telephone man will share in his joy and pleasure for having made him so.

The Twisp-Barron, Twisp-Conconully and Twisp, Chelan and Wenatchee telephone lines are projects growing out of the visit of Forest Supervisor George W. Milham to Twisp, Wash., northwest of Spokane. The Twisp-Barron line extends 45 miles to the north from Twisp, passing through Winthrop, Mazama, Robinson and to Barron in the Slate creek mining district. The Twisp-Conconully line traverses forty miles to the eastward over the old Loop Loop road. The Twisp-Chelan line covers twenty-eight miles to the southwest over the Gold Creek trail, and the Wenatchee extension adds seventy miles more. Mr. Milham has made a proposition that the department will furnish all the material for the construction of the lines and string the wires if the people will prepare, deliver and place the poles in position, and cut out the right of way. There is to be no charge for the use of the service. Instruments will be placed at the various points along the lines. Barron, Robinson, Winthrop and Mazama are now without telephonic communication with the outside world. The property owners and miners of the Slat creek district must go forty-five miles to Twisp to get a message started and then it is frequently impossible to send the messages. The service provided by the Pacific States Telephone Company is censured, condemned and denounced in language forcible and picturesque by the county press and anathematized by the business man.

The Cheney telephone exchange has been sold by W. T. Du Bois to the people of Cheney, Wash., southwest of Spokane. When Mr. Du Bois bought the exchange a short time ago, he was given a franchise to operate it for years. There has been much complaint on account of the poor service given by the Pacific States Company, and when the Commercial Club began an agitation for better service, the company expressed a desire not wishing to make the improvements demanded by the people. After granting a 15-cent rate over its long-distance line into Spokane it turned its interests over to local capital, which will improve the service.

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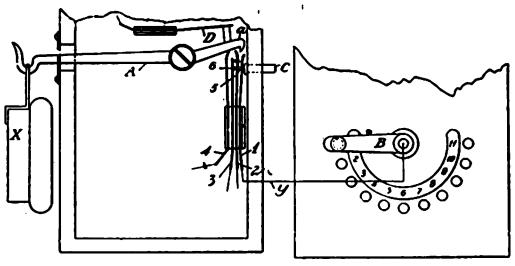
Recent Telephone Patents

By David S. Hulfish

866,639. Automatic Circuit. Edward F. Fales, assignor to Automatic Electric Co., Chicago. Filed February, 1907. A new release circuit for automatic switches for the Strowger type, all the release magnets of a connection being included in one circuit.

866,645. Anti-Hummer. Nels O. Hagen, Pekin, N. D. Filed May, 1907. A U-shape resilient element surrounds the insulator knob and takes the strain of the line wire.



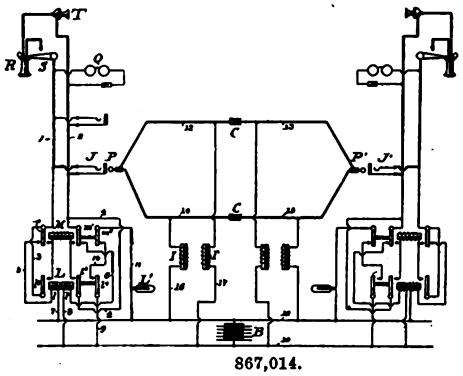
866,794

866,714. Switchboard System. Henry P. Clausen, assignor to American Electric Telephone Co., Chicago. Filed October, 1901. Improved local signal circuits for a three-wire multiple switchboard.

866,735. Protector. Charles A. Rolfe, assignor to Rolfe Electric Co., Rochester, N. Y. Filed January, 1902. A unit of heat coil and fuse for telephone line protection.

866,760. Ringer. Francis H. Whitman, Cambridge, Mass. Filed December, 1906. Grooves around the free ends of the cores hold a slotted yoke which supports the armature; adjustment means for the armature is provided.

866,794. Hookswitch. Charles E. Lee, assignor to Electric Goods Mfg. Co., Boston. Filed February, 1906. The hookswitch, which is for intercommunicating system, is shifted by a push button, manually, and is snapped off by the hook lever when the receiver is hung up. (See cut.)



867,014.

867,014. Switchboard System. Edward E. Clement, Washington, D. C. Filed December, 1904. A line signal circuit for a two-wire multiple switchboard. (See cut.)

867,212. Protector. Charles A. Rolfe, assignor to Rolfe Electric Co., Rochester, N. Y. Filed September, 1905. A central office protector for telephone lines, having the usual functions. The heat coils are arranged flatwise against the side of the support.

867,349. Testing System. W. W. Dean, assignor to Kellogg S. & S. Co. Filed July, 1903. A busy-test system for two-wire common battery switchboard.

867,658 and 867,659. Conductor. William Hoopes, Pittsburg, and Norman A. Robertson, New York. Filed January, 1905. A bimetallic wire and process of making it. The wire is of aluminum, with a strengthening steel core.

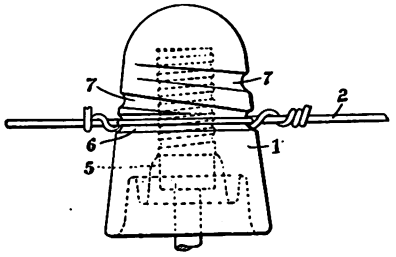
867,707. Coin Collector. E. B. Craft, assignor to Western Electric Co., Chicago. Filed February, 1907. The coin is deposited in a register and after having been registered it passes to the line signaling position of the well-known W. E. coin box.

867,746. Coin Collector. J. L. McQuarrie, assignor to Western Electric Co., Chicago. Filed February, 1907. A modification of the well-known W. E. coin box. All coins pass through a coin register, the first coin of a group passing thence to the line signaling contacts, and succeeding coins passing directly to the till.

867,892. Telephone System. Frank E. Mayberry, assignor to Boston Telephone Selector Co., Boston. Filed August, 1902. A system for controlling central office signals through a momentary substation ground given by the movement of the switchhook.

867,896. Wireless Telephony. H. A. McCarty, administrator, assignor to McCarty Wireless Telephone Co., San Francisco. Filed September, 1906. An arrangement of parts for wireless transmission whereby the transmitted waves are modified by a telephone transmitter.

867,901. Insulator. John C. Barclay, New York. Filed July, 1907. From the tie-wire groove of the usual type of glass knob, a spiral of screw-thread groove extends to the



867,901.

top of the knob. A new knob is placed by screwing it into the old tie-wire and onto the pin at the same time. (See cut.)

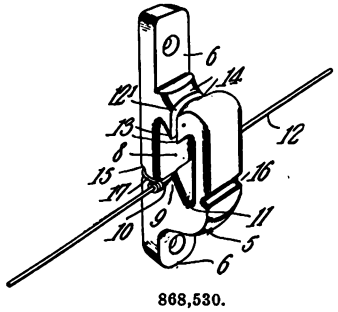
867,955. Coin Collector Circuit. A. F. Dixon, assignor to Western Electric Co., Chicago. Filed March, 1907. Each coin passes through a registering device before being passed to the line signal contacts of the usual type of Western Electric coin box, and a contact on the registering device opens the circuit of the line signaling contacts while the coin is passing.

868,083. Attachment. Adelbert L. George and Austin B. George, Dixon, Ill. Filed February, 1907. A tablet shelf and pencil hook are designed for attachment to the lower surface of a wall telephone set.

868,178. Splicer. George H. Goughnour, Stuart, Iowa. Filed September, 1906. A hand tool for making the standard Western Union joint.

868,245. Audiphone. John A. Baker, Seguin, Texas. Filed August, 1904. A multiple receiver, with a plurality of amplifying cones, designed for talking into the room.

868,300. Clip. Harry E. Sohner and William H. Benjamin, Monclair, N. J. Filed April, 1906. An improved design



868,530.

of tip for flexible cords. A locking member prevents slipping from its clamping post even when unclamped.

868,511. Hanger. Thomas A. Walsh, Yonkers, N. Y. Filed July, 1907. A slotted metallic band, with locking lugs.

868,530. Insulator. John A. Cooper, Mercury, Texas. Filed June, 1907. A side-wall insulator having two seating grooves for line wires, and tying grooves for each. A slot admits the line wire to either seating groove. (See cut.)

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868,544. Attachment. Joseph A. Gordon, Shawnee, Okla. Filed February, 1907. An auxiliary mouthpiece with voice screen and locking device.

868,576. Pole-Changer. Ewing McLean, Greencastle, Ind. Filed March, 1906. A pole-changer of the vibrating type, giving positive, negative and alternating ringing currents.

868,594. Attachment. James H. Blythe, Denver, Colo. Filed May, 1906. A step-by-step device for party-line stations. A ratchet at the substation is operated from the central office and controls the substation circuits.

868,843. Cross-Arm. Wellington S. Clay, Hutchinson, Minn. Filed September, 1906. A channel iron cross-arm, a clamping yoke passing around the pole, and braces locking into slots in the iron arm.

868,880. Marine Telephone. Arthur J. Mundy, assignor to Submarine Signal Co., Waterville, Maine. Filed April, 1902. Marine sound vibrations are received by a submarine electric transmitter and thence passed to telephone receivers. The transmitters are enclosed in a chamber constituting at the same time a sound focussing device.

868,933. Automatic Exchange. Frank A. Lundquist, Chicago. Filed May, 1904. System and apparatus for operating party lines in connection with an automatic telephone exchange.

869,060. Fuse. Frank B. Cook, Chicago. Filed October, 1906. The line wire clamp of a tubular line fuse is made with an integral thimble for embracing the end of the fuse and forming a terminal for the fuse wire, whereby the parts are assembled.

869,067. Switchboard System. W. W. Dean, assignor to Kellogg S. & S. Co. Filed February, 1903. Upon the insertion of the ringing plug into the line jack, the subscriber's bell is rung automatically, relieving the operator of the duty of manipulating the ringing key.

869,096. Slug. Herbert T. Lloyd and Richard Brash, Denver, Colo. Filed September, 1906. A coin slot has a bar across the entrance, and the slug used therewith is circular, but has a slot from center to circumference to permit it to pass the bar.

869,119. Switchboard System. H. G. Webster, assignor to Kellogg S. & S. Co. Filed December, 1902. A two-wire multiple switchboard system with two-way cords.

Varied Uses of the Telephone

A CANADIAN writer who evidently keeps a scrapbook has taken stock of the various uses of the telephone. His collection is a curious one, indeed, and well worth reading. Although it is made up of clippings, many parts of it merit reprinting.

A recent advance, says the collector, in many respects remarkable, is the private branch exchange for large stores. An establishment in New York has a switchboard with fifty trunk lines. Connected with the switchboard are 1,000 telephones. Customers are able to use any one of these as a public telephone, and can have the free use of them to any part of the store with which they may wish to talk. Either in the store or at their homes they can give orders to any department.

From the Montreal Standard he has learned that the telephone has been used to break "log jams," the terrible bane of the Canadian river man's life. No more interesting incident of modern invention into the pathless forests of North America is on record and none more beneficent because it saves hundreds of lives every year. The life of the Canadian logman, the hard work of floating big logs down the turbulent streams to the sawmill, presents a scene into which it scarcely seems the ingenious inventor would ever break his way. But the telephone has made log jams a thing of the past. This is an occasion of rejoicing to the woodman, but not to the devotee of picturesque scenes of the woods. It is a wonderful sight to see the logs piled almost inextricably on top of each other in a rushing stream, and it is a thrilling spectacle to watch the daring woodsman cut away the log that is the key to the jam, and then as the logs begin to move, see him skip nimbly over the moving pieces of timber to safety on shore. Now, however, the man who makes his annual trip into the woods to watch the logman bring the fruits of a winter's work down a mountain stream will be disappointed. The jams are seldom permitted to form. At the first sign of a clog one of the men patrolling the banks of the river telephones upstream to have the flow of logs stopped in the quiet stretches, called "trips." In this way the jams are nipped in the bud. As soon as the incipient trouble is over the men along the trips are notified by telephone and the stream of logs moves along again.

Returning to commercialism, it is found that the private exchange system in large stores is made to form an essential part of a new method of advertising in which the personality of the salesman in its relation to regular customers is turned to the advantage of the house. Clerks are encouraged to call up their acquaintances or customers, and tell them of any good things in the way of bargains that may be available. Where an employe is both widely known and popular, this method of business solicitation is often employed with astonishing success.

A company which takes charge of the stenographic work of various offices maintains a staff of efficient stenographers. The subscriber can at any time communicate with the office through a telephone, which is installed by the company. He is at once connected with a stenographer, who takes his dictation either by notes or on the typewriter, as preferred, using his personal stationery, which is, of course, kept on file. The finished work is then enclosed without folding in a large envelope, sealed and delivered at once by special messenger service. The monthly statements rendered to clients of the company are often found to be of the utmost service, as they are itemized in every detail, thus forming a valuable reference index of correspondence to the business man.

A patent has been taken out in Germany for applying the telephone to detect the whereabouts of fish. A microphone enclosed in a water-tight case is sunk below the water by wires. These wires are connected with a telephone on board the fishing vessel. As long as the transmitter hangs free no sound is heard, but as soon as a school of fish passes by, a tapping noise caused by its passage at once gives notice of its presence. The apparatus is gauged to give the exact depth at which the school is swimming.

The telephone is now used in locating gold quartz lodes, with or without iron pyrites, and in the detection of other minerals this electric "dowser" is being used with better results than are usually secured by other methods.

A Kentucky water company decided to paint the inside of a large standpipe. A raft was constructed to float upon the water within the pipe and serve as a platform on which the painters could work. Installed with the tube and connected with the pump room of the plant was a telephone. When the men had painted as far as they could, they would signal the engineer to raise or lower the water, as might be desired. In this way a great deal of time was saved, as well as the cost of staging, which previously had been used.

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The special domestic uses to which the telephone is

now applied are innumerable. In Iowa the death of a girl from diphtheria prevented the family having a funeral which friends could attend. To comply with the last request of the deceased that the sermon should be preached at the house, a telephone line was run from the church to the house. In this way the officiating clergyman was able to preach to two audiences, one at the church and the other at the house. The latter heard the words and music of the service with perfect distinctness.

The patients in many hospitals are now enabled to hear the whole of the church service by telephone connection with the church and the megaphone which is kept in church for this purpose. In a New Jersey town a patient who was suffering from a contagious disease relieved the tedium of his confinement by telephone talks with some of his friends outside. When the patient got well the instruments were burned. In another case in Indiana a family was quarantined on account of smallpox. Two sons of the family were anxious to graduate, and to miss school rendered their examination and standing doubtful. The school teacher determined to use the telephone in keeping up the studies of his absent pupils, and for more than two weeks he daily and regularly assigned to the boys their lessons, and heard them recite them over the telephone in the evening after regular hours. The plan was so successful that as soon as the boys recovered they graduated with credit.

A young fellow in Utica who was studying the cornet with a professor injured his leg and was unable to leave his home. The professor hit on the expedient of transmitting his musical instructions over the telephone. The experiment worked satisfactorily, as the notes of the instrument were heard clearly at the receiving end of the line and the spoken suggestions of the professor were just as audible.

The degree to which the telephone has relieved the monotony of country life is not generally realized. The president of a country woman's club says that in rural districts the instrument is a veritable cheer distributor. In the dull winter days when her husband was in town and the children were at school, her spirits would sometimes flag. Instead of flying to a quinine pill or a dose of cut-rate tonic, she would go to the telephone and call up some of her friends, either in town or in the country, have a pleasant little talk and go back to her sewing or work refreshed and braced in mind and body.

In many country districts the telephone has worked changes in political methods. In some counties in Missouri where the farmers have organized telephone companies the cost of the service is low. As a result the political machine which for so many years dominated the state has been unable to call snap primaries anywhere through the county committees it controlled or to make headway in the sharp practice of certain classes of politicians. Whenever the orators for the machine begin a campaign in any county the farmers get busy with their telephones. They call township meetings and adopt their own resolutions, and in a few days have the county as thoroughly organized as in former years the politicians had it organized for a general election.

A traveler, in dwelling on the persuasiveness of the telephone, tells how, when he was coming with a party of sportsmen down the west branch of the Penobscot in the wilds of Maine, they were astonished one morning to see the guides turn their canoes to the bank, although there were no indications of rapid water to necessitate making a carry. They were still further puzzled when the guides remarked that they were going to order their supper. One of them opened a small box of a lumberman's telephone at the side of a tree and telephoned to a camp many miles away, stating that the party would arrive at night and giving directions for supper. Ten hours after, when the camp was reached, everything connected with the supper, including the weary tourists, was ready.

An incident in long-distance machinery repairing illustrates the adaptability of the telephone. A shoe manufacturer in St. Louis ordered from a Boston firm a machine for putting eyelets into shoes. The machine was sent, but the persons who set it up did not succeeded in making it work to their satisfaction. A long correspondence was carried on between the buyer and the seller of the machine, but no definite indication of the cause of the failure seemed to be reached. One of the experts in the Boston office at last bethought himself of the long distance telephone, and at once had himself connected with the operating room in St. Louis. The machine was then set to work and the expert in Boston listened. He soon discovered from the sound where the trouble was, and it was remedied from his instructions by the operators.

Invention of the Telephone.

The death in Paris of Charles Bourseul, a retired employe of the French postoffice service, recalls the days of polemic discussion over the invention of the telephone, in which the names of Bourseul and Reis occupied such leading places. The claims made for Bourseul rest upon the following passage from a paper which he published in 1854:

"Suppose that a man speaks near a movable disk, sufficiently pliable to lose none of the vibrations of the voice, and that this disk alternately makes and breaks the current from a battery; you may have at a distance another disk which will simultaneously execute the same variations. * * * It is certain that in a more or less distant future, speech will be transmitted by electricity. I have made experiments in this direction; they are delicate, and demand time and patience, but the approximation obtained promises a favorable result."

This was published some years before Philip Reis began his investigations. Writing in 1868, Reis said: "Incited thereto by my lessons in physics in the year 1860, I attacked a work began much earlier concerning the organs of hearing, and soon had the joy to see my pains rewarded with success, since I succeeded in inventing an apparatus by which it is possible to make clear and evident the functions of the organs of hearing, but in which also one can produce tones of all kinds at any desired distance by means of the galvanic current. I named the instrument 'Telephon.'"

In the great suits involving priority in the invention of the telephone, the claims for Reis, based upon this publication, upon an article in the *Gartenlaube* and an illustration of his apparatus in the catalogue of an instrument dealer, were strongly pressed, the charge being specifically made that Bell had derived the idea of his telephone from one or more of these sources. On the other hand, other suits were based upon the allegation that an application for a patent filed by the late Elisha Gray was revealed to Bell by one Wilbur, an employe of the United States patent office. Neither of the above charges were substantiated to the satisfaction of the courts.

The following note relating to Bourseul appeared after his death in the Paris edition of the London *Mail:*

"Some years ago M. Bourseul, who was living in retirement on his postoffice pension, asked for an audience of the postmaster general. On being asked his name, he gave it as 'Bourseul, inventor of the telephone.'

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"It was supposed that he was a harmless lunatic, but when he proved that he was a retired member of the postoffice staff, M. Mougeot caused an inquiry to be made into his antecedents, and was astonished to discover from the documents filed in the postoffice archives that the old fellow had spoken the truth, and that in 1854 Bourseul, after vainly offering his invention to the French postoffice, had published a full description of his invention in several technical periodicals. This detailed description is of far too technical a character for publication in the *Daily Mail,* but it will suffice to say that the principle of Bourseul's instrument—which he did not call a telephone—was absolutely identical with the telephone, the letters patent of which were applied for by Graham Bell at Washington on February 14, 1876—or twenty-two years later.

"Bourseul, as is shown by the correspondence in the postoffice archives, spent five years in endeavoring to induce the French postoffice to take up his invention, but the authorities refused to take his invention seriously.

"On learning these details, M. Mougeot sent for the old gentleman, and asked him what he wanted. Bourseul complained that he found it difficult to make both ends meet with the small pension he was in receipt of. M. Mougeot, with the approval of the French government, thereupon increased the old man's pension by £120 per annum, whereupon Bourseul returned in great delight to the country place to which he had retired.

"The president of the French Telephone Subscribers Association says that his death would probably have passed unnoticed but for the fact that Prof. Hodge, in a recent lecture on the telephone at Pittsburg, declared that the original inventor of the telephone was the Frenchman Bourseul. There is some question of raising a monument to Bourseul as the inventor of the telephone."

Six Telephone Rules.

One of the assets of the man who does business today is his telephone voice, provided he knows how to make a good impression when he talks over the wire. All sorts of affairs are now conducted by telephone, but the importance of telephoning in the proper way is often overlooked by business men who would on no consideration permit a poorly typewritten letter to leave their offices.

Take the trouble to fix firmly in your mind half a dozen simple rules, put them in practice and see if your telephone conversations are not made of increased value in your business. Here are the rules:

1. When you are talking by telephone to a person in your home town speak in an ordinary tone of voice. Do not whisper into the transmitter, but, on the other hand, do not shout at the instrument as if you had a grudge against the telephone system and everybody who uses it.

2. When you are using a long-distance line elevate your voice and speak a little louder than you would speak to a man sitting in the room with you. This does not mean, however, that you should try to make noises as loud and discordant as those produced by the calliope in the circus parade.

3. Besides speaking distinctly, avoid talking too fast. There are orators who reel off words at the rate of 300 a minute and still make themselves understood, but they couldn't do it by telephone.

4. When you telephone devote yourself to telephoning. When you are writing a letter you do not, at the same time, look out the window to see who is going by on the other side of the street. If you turn your back on the telephone and send your words flying hither and yon all over the room and into the great world outside, it is not fair to blame the apparatus and the man at the other end of the line if he does not hear all that you say.

5. Remembering Rule 4, speak directly at the transmitter. Don't get so near it that you seem to be trying to crawl into it. Neither should you keep it at arm's length. It won't hurt you. Sit or stand so that your lips are about an inch from the transmitter and your words will go flying on their journey without trouble.

6. If you are using a desk telephone, don't hold it upside down, or at all sorts of odd angles. The desk telephone was made to do its work when standing on its own base or held in a perpendicular position. You would not expect a thermometer to be accurate if you hung it wrong side up. Why not use the telephone as it was intended to be used?

Reasons for the Advent of the Independent Telephone.

The primary reason for the existence of the Independent telephone movement is, that there was at its inception, and is today, a great unfilled demand for telephone service. The old company with its hundreds of millions of capital was unable to take care of the growth at the time the Independent movement started, and today after thirty years of development the combined interests of the Independent and Bell are not able to take care of the pressing demand for telephone service.

As an evidence that this is a true reason of the existence and establishment of this stupendous movement is the fact that mutual companies are springing up in various localities, for the same reason that the Independents were started today, as then, an unsupplied demand for telephone service. Wherever there is a community of a few hundred people, there is found a demand for telephone service, generally for the service that will put them in touch with the nearby towns. If these towns are supplied with Independent telephones, then such communities wish service with the Independents, if not, then the Bell. But if they cannot get service and connection with either, then they proceed to supply themselves by forming mutual companies, not for profit, but for local service, and finally get connection with the larger towns in various ways.

Telephone companies sell nothing but service. The plant is left intact after use from time to time. It is not like a stock of merchandise that it decreased with active trade. The plant of a good telephone company grows in value with the increase of population and nothing is sold that detracts from the plant. Service is rendered and charged for. All that is necessary is to perform it satisfactorily. $1,000 per month income from rentals is about on par with a merchant selling goods sufficient to make that amount in gross profit.—Theodore Gary.

The Interstate Telephone Company has opened a second telephone line to St. Maries, Ida., east of Spokane, the service being by way of Mount Hope and Rockford. The two new circuits of the company between St. Maries and St. Joe have been completed and the construction of twenty miles of new line up the St. Joe river along the Chicago, Milwaukee & St. Paul railway company's new line, and will also extend the line to Harrison.

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Record of a Single Month

PERSONALS.

R. F. Ernest is the new manager of the exchange at East Peoria, Ill.

Manager E. H. Sidwell, of the Johnson County Telephone Company, Iowa City, Iowa, has resigned.

G. W. Johnson, of Minneapolis, has been made district manager for the Tri-State Telephone Company.

Ralph T. Wolfrom has recently been elected director and secretary of the Bellevue Home Telephone Company, Bellevue, Ohio.

Edger Y. Sanders has resigned as manager of the exchange of the East Tennessee Telephone Company at Bristol, Tenn.

W. K. McQuown, who has been manager of the Pekin telephone exchange at Delavan, has been appointed manager of the exchange at Havana, Ill.

Jay Cory has resigned as manager of the Butler County Telephone Company to become manager of the Arkansas City Telephone Exchange at Eldorado, Kans.

Jay Mercer, formerly located at Uray, Colo., has recently accepted the position as manager of the Farmers & Merchants Telephone Company at Pawnee Rock, Kans.

Geo. H. Pierce, of the American Electric Supply Company, suffered an operation at one of the local hospitals early in the month. He emerged in better health and spirits and is back in the field.

C. C. Nelson, who has been general manager of the Nicollet County Telephone & Telegraph Company, at St. Peter, Minn., for some time, has resigned his position. He will withdraw from the board of directors.

H. H. Bratt has been promoted to the position of general manager of the Union Electric Telephone & Telegraph Company at Rock Island, Ill. The company will build a toll line to Clinton, Iowa, which will give local patrons access to Sterling, Aurora, Springfield and other Illinois cities.

Henry C. Larrabee, formerly a well-known member of the installing staff of the Dean Electric Company and more recently connected with the United States Signal Service as assistant electrical engineer, was married on September 25 to Miss Marion Perkins at Woodfords, Maine.

J. A. Kenny was in the city recently exhibiting and taking orders for the black enameled magnet wire which the American Electric Fuse Company is putting on the market. The "dope" wire is being received with considerable interest by the trade and judging by the smile of satisfaction Mr. Kenny carried, the sales are in good quantity.

NEW COMPANIES.

BEALLSVILLE, Ohio.—The Citizens, Telephone Company, with headquarters at this place, has been incorporated under the laws of Ohio.

LEBANON, Ohio.—The Valley Telephone Company has been incorporated with a capital stock of $100,000, by O. W. Blake and others.

WALTON, N. Y.—The Walton Telephone Company has been incorporated with a capital stock of $30,000, by C. Burman Guild and others.

CHILI, Ill.—The Chili Mutual Telephone Company has been incorporated with a capital stock of $10,800, by David G. Goff, John O. Carlin and D. G. Carlin.

PAULDING, Ohio.—The Marion Telephone Company has been incorporated with a capital stock of $7,000, by J. H. Kramer, V. F. Loctlefeld and Gast B. Evers.

MATTOON, Wis.—The Mattoon Telephone Company has been incorporated with a capital stock of $2,500. Incorporators, Theo. Krez, J. F. Riordan and R. E. Hemingway.

WHITE SALMON, Wash.—The White Salmon Valley Telephone Company has been organized with a capital stock of $50,000 by R. A. Burkett and W. H. Doan.

FLORIDA, N. Y.—The Florida Telephone Company has been incorporated with a capital stock of $5,000. Incorporators: George S. Vail, E. E. Tether and J. K. Roe.

HALLSVILLE, N. Y.—The Hallsville Telephone Company, which has a capital stock of $25,000, has been incorporated, and expects to install a telephone system in this city.

DUBUQUE, Ia.—The Standard Construction Company has recently been incorporated with a capital stock of $75,000. It will operate and construct telephone and telegraph lines.

HOBART, Okla.—The Mission Telephone Company has been incorporated with a capital stock of $5,000. The incorporators are: D. C. Enochs, J. L. Burdett and S. B. Christy.

TONTI, Ill.—The Tonti Telephone Company has been incorporated with a capital stock of $500. The incorporators are J. H. Kreitzer, Walter Cope, Jacob Hershberger.

WEIR, Tex.—The Walberg-Weir Telephone Company has been incorporated with a capital stock of $2,000. Incorporators, Frank Doering, A. M. Nalley, J. W. Long and others.

RYDER, N. D.—The Queen City Telephone Company has been incorporated with a capital stock of $5,000. Incorporators: Lloyd S. Officer, M. A. Officer and I. E. Officer.

RICHMOND, Wis.—The Richmond Telephone Company, Walworth county, has been incorporated with a capital stock of $2,500. Incorporators: John D. Clark, George Crumb and Robert Harris.

BLACKBURN, Okla.—The Daisey Mutual Telephone Company has been incorporated with a capital stock of $5,000. Incorporators: G. W. Kinneer, J. O. Ousley, Thomas Morris and others.

ENDERLIN, N. D.—The Enderlin Telephone Exchange Company has been incorporated with a capital stock of $50,000. The incorporators are: Dan H. Hurd, May E. Hurd and S. F. Scott.

KNOXVILLE, Ohio.—The Knoxville Telephone Company has been incorporated with a capital stock of $3,000. The incorporators are: W. H. McCleeland, James Alexander and J. H. Cooper.

UNICO, Tenn.—The Unico Telephone Company has been incorporated with a capital stock of $5,000. Incorporators, J. F. Toney, W. A. Roberts, A. B. Brown, J. M. Lucas, R. N. McIntuff.

WATERVILLE, Wash.—The Entiat Telephone & Telegraph Company has been incorporated by Frank E. Knapp, D. M. Farris and P. M. Martin. The company will operate in Big Bend county.

DILL, Okla.—The Dill Farmers' Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are: W. R. Room, W. C. Larmer, C. C. Hickman and Lee L. Bishop.

OKLAHOMA CITY, Okla.—The Evansville Telephone Company has been incorporated with a capital stock of $1,500. The incorporators are: W. L. Lambert, W. C. Yeachum and A. Burrows, of Meridian.

CHICAGO, Ill.—The Central Telephone & Supply Company has been incorporated with a capital stock of $25,000. The incorporators are as follows: Edward J. Novak, Sidney S. Pollack and Otto Kerner.

HAGERSTOWN, Ind.—Plans are being considered by the citizens of Hagerstown for the formation of a mutual telephone company. Among those actively interested in the new project is Aaron Wollard.

GANN VALLEY, S. D.—A telephone company is being organized in Gann Valley to put in a local exchange and build rural lines. It expects to have about twenty-five miles in operation before winter.

GENEVA, Neb.—The Easy Street Telephone Company has been organized and the following officers elected: Ed Yates, president; J. P. Dana, vice-president; J. H. Morgan, secretary; Mark Butler, treasurer.

CHOCTAW CITY, Okla.—The Choctaw City Telephone Company, of Choctaw City, has been incorporated with a capital stock of $1,500. The incorporators are: J. F. McIrwin, T. J. Rowlin and George R. King.

BURNT RIVER, Ont.—An Independent telephone company is being formed here under the name of the Victoria Telephone Company, to construct a line from Burnt Orange to Fenelon Falls, by way of Bury's Green.

EAST BLOOMFIELD, N. Y.—Ontario County Mutual Telephone Company has been incorporated with a capital stock of $30,000. Incorporators: B. A. Partridge and Oliver Dibble, East Bloomfield, N. Y.; C. R. White, Iona, N. Y.

POCAHONTAS, Ark.—The Ozark Telephone Company has been incorporated with a capital stock of $25,000. The incorporators are: E. Dalton, president; Mary E. Dalton, Thomas W. Campbell, G. A. Davis and G. D. Wells.

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WILLARD, N. M.—The Sunshine Valley Public Utilities Company has been incorporated with a capital stock of $25,000, by H. A. Hart, who will be general manager. A telephone line is to be built by the new company for Estancie Valley.

SHENANDOAH, Pa.—The Farmers' Independent Telephone & Telegraph Company has been organized by the following: David Horn, Alfred Teter, W. L. Witmer and others. The capital stock is $5,000. The charter has been applied for at Harrisburg.

OLUSTEE, Okla.—The Quanah-Mangum Telephone Company has been incorporated with a capital stock of $15,000. The incorporators are: E. B. Jeffery and J. A. Henry, of Altus; Kate S. Smith, of Oklahoma City; and R. W. Smith, of Ennis, Texas.

ST. JOHN, N. B.—A company called the Citizens' Telephone Company, Ltd., with a capital stock of $24,000, is seeking a charter to fight the New Brunswick Telephone Company in the town of Woodstock. The leading business men are behind the company.

SERGENT, Ky.—Plans are under way for the incorporation of the Sergent-Ola Telephone Company, which expects to construct a line from Sergent, by way of Colly, to Ola. Work will be commenced at once under the management of W. R. Webb.

CLARESHOLM, Alb., Can.—The Prairie Farmers' Telephone Company, with headquarters at Claresholm, has been incorporated for the purpose of building rural lines from this city to the Star district. Construction work will be commenced as soon as possible.

VICTOR, N. Y.—Business men in Naples, Bristol, East Bloomfield, West Bloomfield and Victor are organizing an Independent telephone company, and intend to construct lines to give service to these towns and to connect with Independent lines in other towns.

WINSTON-SALEM, N. C.—The Dosier Telephone Company has been incorporated to operate a telephone system in Forsyth county. The authorized capital stock is $9,000, with $600 subscribed. The incorporators are: A. E. Shore, J. A. Wall, R. H. Daub and others.

HARTINGTON, Neb.—About twenty farmers have organized the telephone company known as the Bunker Hill Company, to run a little line to Wynot. The officers are: Frank Thoene, president; Anton Hesse, vice-president; Jesse Brandrup, secretary, and Chris Schaller, treasurer.

BERWICK, Pa.—The Bowlerville Telephone Company has been organized by Bruce B. Freas, vice president; Elisha Ringrose, president; John Scott, secretary; Boyd Freas, treasurer. Its plans are the construction and maintenance of a telephone system between West Berwick and Orangeville.

SERGENT, Ky.—Among the newly organized Independent telephone companies is the Letcher County Telephone Company. The company has an authorized capital stock of $2,000, and expects to install an up-to-date plant at this city. Among the incorporators are J. E. Venters, B. Venters and others.

SOLDIER, Idaho.—The Soldier Local Telephone Company has been organized with a capital stock of $48,000. Its object is to build and operate a line on Camas Prairie, headquarters at Soldier, and branch lines to Gooding, Boise and Hailey. The directors are Frank Housman, A. G. Barker and D. H. Gwinn.

HARTFORD, Conn.—The Gibson Manufacturing Company, of Danbury, has been incorporated with a capital stock of $5,000. The purpose of the company is to manufacture and sell electrical and mechanical and telephone apparatus. The incorporators are: Edward A. Stratton, William Gibson and Emma Gibson, all of Danbury.

MANTEO, N. C.—Articles of incorporation have been filed by the Roanoke Island Telephone Company, whose object it is to construct a telephone system in and about this city. It has an authorized capital stock of $1,000 and the incorporators are: Theo. S. Meekins, R. U. Smith, S. C. Griffin, J. D. Hayman and W. J. Griffin.

SEMINARY, Miss.—An independent telephone company, whose purpose is the construction and maintenance of telephone lines in Seminary and throughout the surrounding country, and to be known as the People's Telephone & Telegraph Company, has been organized by a number of the most prominent business men of this place.

BLUFFTON, Ind.—The Home Telephone Company, which has recently been granted a twenty-five year franchise, has filed articles of incorporation with the secretary of state. Capital stock, $20,000. The following persons have been named as directors: C. E. Brown, W. H. McPherson, Chas. F. Robertson, Henry Rust and Oscar Brooke.

GARYSBURG, N. C.—The Farmers' Mutual Telephone Company, recently incorporated, with a capital stock of $25,000, expects to build lines from Garysburg to Roanoke Rapids, Pleasant Hill and Vincent's Cross Roads, in North Carolina and to Emporia, Va. The following are incorporators: W. H. Joyner, J. H. Fitzhugh, J. H. Suiter and others.

MCKINNEY, Tex.—A company of Dallas capitalists concerned in the movement to establish an independent telephone system in Dallas, with long distance connections, has purchased from Jesse Warden an Independent telephone franchise in McKinney. Following the establishment of the new system in Dallas, improvements will be made by the company in this city.

BRADLEY, Ark.—Articles of incorporation have been filed by the Walnut Hill Telephone Company. The company contemplates the construction and operation of telephone plants at Walnut Hill and Lewisville, in Lafayette county, and at Waldo, in Columbia county. It has an authorized capital stock of $15,000 and the incorporators are: J. Maston, A. H. Hampter, J. W. Warren, G. M. McKnight and J. McCormick.

DIXON'S SPRINGS, Tenn.—The Home Telephone Company has been organized here. The company will build an exchange and install a modern system in Dixon's Springs and will connect with Hartsville, Hillsdale, Gallatin and other points. The officers and directors are: I. P. McDonald, president; Johnson Beasley, vice-president; James J. Gregory, secretary; Jesse Beasley, treasurer; J. D. Rollins, Pole Beasley, W. W. Morton and W. S. Oldham.

POMPEII, Mich.—Citizens of this town and Washington Center have organized a local telephone company to be known as the Washington Center Telephone Company. The officers and directors are Frank Cammeth, president; Henry Inglis, secretary; S. N. French, treasurer; Henry Seivert, Clarence Hensen and J. F. Sutten. The company will be a puely local one, but will furnish long distance connections with the Union company.

HOT SPRINGS, N. C.—Among the newly organized independent telephone companies is the Spring Creek Telephone Company, of Hot Springs, Madison county. It expects to build and operate telephone lines from Hot Springs to points in Buncombe and Haywood counties. The capital stock is given at $5,000, of which $1,275 has been subscribed. Among those interested in the enterprise are I. N. Ebbs, C. F. Ebbs, T. Frisbee, Thomas Lawson and others.

ELECTION OF OFFICERS.

FARMINGTON, Ill.—The Farmington Telephone Company has elected F. S. Vandersloot, president; Dr. J. W. Connelly, vice-president.

BARNESVILLE, Ohio.—The Belmont Telephone Company recently elected John A. Howard as president and A. H. Dounda as manager.

EVERETT, Wash.—The new officers of the Independent Telephone Company, at this city, are: C. S. Wiley, president; J. M. Winslow, secretary-treasurer.

ASHTON, Ill.—The following directors have been elected by the Farmers' Telephone Company: Chris Cross, M. Berry, G. R. Charters and William Becker.

LONG GROVE, Ia.—The Long Grove Telephone Company has elected the following officers: R. K. Brownlie, president; Geo. P. Maxwell, secretary and treasurer.

ASHLEY, Ill.—At the annual meeting of the Ashley Telephone Company the following officers were elected: J. A. Dycus, president; W. H. Seibert, secretary; Henry Gilbert, treasurer.

ELLSWORTH, Ill.—At the annual meeting of the Dawson Township Mutual Telephone Company, Mr. Richardson was elected president and W. D. Wrightman secretary and treasurer.

KNOXVILLE, Ohio.—The stockholders of the Knoxville Telephone Company have elected the following officers: C. B. Smith, president; Geo. Grimm, vice-president; James McClelland, secretary.

MATTOON, Wis.—The Mattoon Telephone Company, recently organized, has elected the following officers: Dr. J. F. Rordan, president; Sam Krantz, secretary; E. E. Hemmingray, treasurer; D. Lightbody, vice-president.

MONROE CITY, Mo.—The Farmers' & Merchants' Telephone Company has elected the following directors: J. A. Yates, G. W. Tooley, W. H. Elliott, A. C. Meyers, H. D. Tuesdell, J. H. Gentry, J. H. Bell and others.

BENTON, Ill.—At a recent meeting of the Franklin County Telephone Company the following officers were elected: J. J. Pierce, president; W. S. Means, vice-president; George Young, secretary; O. S. Martel, treasurer.

GREENSRUBG, Ind.—The stockholders of the Independent Telephone Company, the following officers were elected: C. P.

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Miller, president; Morg Miers, vice-president; Charles Zoller, secretary; J. H. Christian, treasurer.

OZARK, Mo.—The stockholders of the Christian County Home Telephone Company elected the following officers: Warren Penwell, president; Lee D. Hewitt, vice-president; Frank Brewer, secretary; C. N. Parker, treasurer.

KIDDER, Mo.—At the annual meeting of the stockholders of the Home Mutual Telephone Company, of Caldwell County, the following directors were elected: J. E. Petree, S. B. Sloan, Wm. Roney, B. L. Sweany, R. A. Caster and others.

KEWANEE, Ill.—At the annual meeting of the stockholders of the Henry County Telephone Company, the following officers were elected: Norman Shearer, Mr. Cosner, vice-president; J. F. Nowers, treasurer; Dr. M. M. Everett, secretary.

SHREVEPORT, Ia.—The North Louisiana Telephone Company, recently organized, has elected the following officers: H. C. Couch, president; Dr. Longino, of Magnolia, vice-president; R. Colbert, secretary and treasurer; H. C. Couch, manager.

HOPEDALE, Ill.—At the annual meeting of the Farmers' Telephone Company, held at this place the following officers were elected: W. M. Mount, president; Dr. R. H. Keyes, manager. Directors: Dr. Keyes, J. J. Unzicker and J. H. Henderson.

ROCHESTER, N. Y.—The Ontario County Mutual Telephone Company has elected the following officers: Dr. B. S. Partridge, president, East Bloomfield; C. R. White, Holcomb, vice-president; R. F. Shar, Holcomb, secretary; O. M. Dibble, Ionia, trasurer.

SHELBURNE, FALLS, Mass.—At the annual meeting of the Heath Telephone Company, the following officers were elected: W. E. Kinsman, president; Herbert Newell, treasurer. Directors: W. E. Kinsman, D. G. Taylor, F. L. Totman, A. A. Barber and A. Newall.

QUINCY, Ill.—At a recent meeting of the County Home Telephone Company the following officers were elected: Charles Achelpohl, president; Thomas S. Elliott, vice-president; Addison L. Taylor, secretary; Henry Wiskirchen, treasurer; Max Reber, of St. Louis, manager.

MORRISON, Ill.—At the annual meeting of the stockholders of the Whiteside Farmers' Mutual Telephone Company, the following officers were elected: C. H. Mason, president; H. L. Ewing, vice-president; C. E. Johnson, secretary; R. E. Cochran, treasurer. Directors: R. E. James and Joseph Burns.

JACKSONVILLE, Ill.—At the annual meeting of the Illinois Telephone Company the following directors were elected: E. S. Greenleaf, A. P. Grout, Judge C. Barnes and Edward P. Kirby. The usual semi-annual dividend of 3 per cent on all outstanding stock was declared, same made payable Dec. 1, 1907.

PAYETTE, Idaho.—The Payette Valley branch of the Independent Long Distance Telephone Company held a meeting here recently and elected the following officers: C. E. Brainard, president; A. J. Swain, Bois, vice-president; C. J. Sinsel, secretary; F. M. Albert, treasurer; J. H. Weider, local manager.

COLUMBIA CITY, Ind.—At the annual meeting of the stockholders of the Whitley County Farmers' Telephone Company, the following officers were elected: Albert Bush, president; Chas. W. Alexander, first vice-president; Everett E. Rindfus, second vice-president; Wm. H. Carter, treasurer; Wm. Rossman, secretary.

GRAFTON, W. Va.—At a recent meeting of the Consolidated Telephone Company, the following officers and directors were elected: Charles E. Manley, president; B. F. Bailey, vice-president; E. Fay Hartley, secretary and treasurer; J. Walter Barnes, manager. Directors: C. E. Manley, E. F. Hartley, J. L. Ruhl, Walter Barnes and B. F. Bailey.

BURLINGTON, Ia.—The stockholders of the Henry County Telephone Company have elected the following officers and directors: W. J. Francy, president; J. E. Peterson ,vice-president; C. W. Alexander, second vice-president; A. D. Hayes, secretary; V. P. Brenneman, treasurer; W. J. Francy, W. R. Buchanan, J. A. Clark, C. P. Johnson and others.

COLUMBIA CITY, Ind.—At the annual meeting of the stockholders of the Whitley County Telephone Company, the following officers were elected: S. J. Peabody, president; George A. Pontius, vice-president; W. H. Magley, secretary and treasurer. The company has 2,200 subscribers connected on the seven exchanges. The capital stock is $100,000. The company will make large improvements and extensions during the coming year.

NEW CONSTRUCTION AND EXTENSION.

LANSFORD, N. D.—The Farmers' Telephone Company will construct many new telephone lines.

BURNSIDE, Wis.—The Farmers' Telephone Company will extend its lines from Castleberg to Mokua.

VIRGINIA, Minn.—The Mesaba Telephone Company will put in new poles between this city and Eveleth.

ANAHUAC, Tex.—A long distance line from Stowell to Anahuac will be constructed by Anson Miller.

LAMB, Ind.—The Farmers' Telephone Company, at this place, will erect and equip a new telephone system.

MARION, Ill.—Dr. J. G. Baker, of Makanda, is in the city for the purpose of installing a telephone system.

DULUTH, Minn.—The Douglas County Telephone Company will erect an exchange building at this place.

WENGLER, Cal.—The Redding-Wengler Telephone Company will build a line from this place to Big Bend.

FAYETTEVILLE, Ill.—The Lookingglass Prairie Telephone Company will build an exchange at this place.

ISHPEMING, Mich.—The Marquette County Telephone Company will install its exchange in larger quarters.

ANNAPOLIS, N. S.—The Nova Scotia Telephone Company will extend and greatly improve its system here.

LOMAX, Ill.—The line between this city and Stronghurst is to be rebuilt by the Lomax Telephone Company.

WOODLAND, Cal.—John Hart will establish a permanent telephone line between Cranmore and Knights Landing.

CHETEK, Wis.—Extensions and improvements in its plant are being considered by the Chetek Telephone Company.

CINCINNATI, Ohio.—Architect Harry Hake is planning a telephone exchange to be erected in Ft. Thomas, Ky.

BRITTON, S. D.—The plant of the South Dakota Central Telephone Company, in this city, is to be entirely rebuilt.

GROTON, S. D.—The Groton-Ferney Telephone Company will build lines into Aberdeen and establish a station there.

INDEPENDENCE, Kan.—Many improvements in its system are being made by the Home Telephone Company in this city.

MARSHALL, Mo.—The Saline County Telephone Company will make extensive improvements in its local exchange.

LOMPOC, Cal.—A number of new rural lines are being erected by the Home Telephone Company in and about this city.

CHESTER, S. C.—The Chester Telephone Company, on account of its increasing business, will install a new switchboard.

HORTON, Kans.—The Home Mutual Telephone Company will extend its lines and its plant will be otherwise improved.

TAOS, N. M.—The Taos Telephone system will be extended to connect with Tusas, Vallecitos, El Vado and Lumberton.

CARYVILLE, Wis.—New lines in this city will be built by the telephone company owned by Messrs. Wagner & Whittaker.

BELLEVILLE, Ont.—The Hastings Telephone Company is constructing a new telephone line from Roslin to Purchase Mills.

PANSY, Wis.—It is the intention of the Badger Mutual Telephone Company to erect a new line from Pansy to Loon Creek.

OCONTO, Wis.—The Farmers' & Merchants' Telephone Company is planning the construction of a number of new rural lines.

HARMON, Ill.—The Green River Telephone Company will extend its lines. General Manager Nugler has the work in charge.

RICE LAKE, Wis.—The Rice Lake and Northwestern Telephone Company will construct a line from Rice Lake to Draper.

PONTIAC, Ill.—The Livingston County Home Telephone Company will build a long distance line between this city and Cornell.

WILMOT, Wis.—The Burlington, Brighton & Wheatland Telephone Company will extend its system to Bassetts and Twin Lakes.

MONTEVIDEO, Minn.—A new line between Watson and Montevideo is soon to be constructed by the Citizens' Telephone Company.

DELEVAN, Wis.—Many improvements in its exchange at this place will be made by the Walworth County Telephone Company.

ABBEVILLE, Ala.—A twenty-mile telephone system from Abbeville into the surrounding country is to be erected by Thomas Willis.

ST. VRAIN, N. M.—Arrangements are being made with the Roosevelt County Telephone Company for an exchange at this place.

MADISON, S. D.—The Great Western Telephone Company is greatly extending its lines and improving its system in every way possible.

SAGINAW, Mich.—The Saginaw Valley Telephone Company is asking for bids for the erection of a new telephone exchange building.

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NAPPANEE, Ind.—The Nappanee Telephone Company is planning extensive improvements for 1908, including 6,000 feet of aerial cable.

VOLANT, Pa.—A number of new lines will be built by the Plain Grove Telephone Company, among them lines to Mercer and Grove City.

SARONA, Wis.—Among the extensions planned by the Basham Rural Telephone Company is the erection of a line from Shell Lake to Sarona.

COLLIERVILLE, Tenn.—The lines of the Collierville Telephone Company will be extended and a new switchboard will be placed in its exchange.

BATAVIA, Ill.—Many extensions in its plant in this city are being made by the Inter-State Independent Telephone & Telegraph Company.

JEFFERSON CITY, Mo.—A new telephone line will be built from this city to Linn, by way of Osage City by the Davis Telephone Company.

RIDGEFARM, Ill.—The Citizens' Telephone Company has opened an exchange at this place. B. F. Canady will have charge of the system.

CHESTER, Vt.—The White River Telephone Company, which is owned by Geo. March, will build a line from Chester to Houghtonville.

IOWA CITY, Ia.—The Johnson County Telephone Company will construct a copper line between here (by way of Washington) to Ottumwa.

WILLOW SPRINGS, Mo.—The Willow Springs Local & Long Distance Telephone Company will construct a line from Willow Springs to Springfield.

DODGEVILLE, Wis.—The New Union Telephone Company is making a number of improvements in its system in this city and many more are planned.

SUGARCREEK, Ohio.—The Berlin Telephone Company is constructing a new telephone line from Barrs Mills to Strasberg. Other lines will be built.

GRANT CITY, Mo.—The Motsinger Telephone Company's system will be thoroughly rebuilt with good cedar poles and all poor wires will be removed.

PALMYRA, Mo.—Permission to erect and maintain a telephone line from this city through South River township has been granted to George H. Bower.

MER ROGUE, La.—The Valley Telephone Company will move its central office to the Ashley House. The system will be generally repaired and improved.

MULLEN, Neb.—More than $600 was raised here for the purpose of building a telephone line from Mullen north to connect with the J. L. Roseberry line.

NEW LONDON, Wis.—The Farmers' Telephone Company, which has been recently organized, expects shortly to commence the construction of its system.

SEMINOLE, Tex.—T. A. Robertson, president of the Seminole Telephone Company, will extend his lines to Plains, the county seat of Yoakum county.

COBDEN, Minn.—A number of lines are to be built by the Cobden Mutual Telephone Company, and its plant made thoroughly modern in every respect.

BRISTOL, Tenn.—Albert Bartlett, president of the Bristol Telephone Company, announces that the company will build a line between Bristol and Blountville.

MONTEVIDEO, Minn.—Frank Bently, manager of the Citizens' Telephone Company, announces that his company will build a line from Montevideo to Watson.

HOWELL, Mich.—The Mutual Telephone Company, which has already built over three hundred miles of new line, expects to still further enlarge its system.

SWANTON, Vt.—To accommodate its rapidly increasing business, a line from Swanton to East Swanton is to be erected by the Northern Telephone Company.

LAS CRUCES, N. M.—T. E. Baker, manager of the Las Cruces Telephone Company, Las Cruces, is preparing to make some extensive improvements in the system.

ANN ARBOR, Mich.—The Washtenaw Home Telephone Company will expend about $25,000 in extensions and improvements, including a new toll line to Detroit.

BURTON, Ill.—A new farmers' telephone line is to be built in the near future and to be known as Burton Farmers' No. 2. The line will connect with Newton.

WOODSTOCK, N. B.—The Citizens' Telephone Company, recently organized at this place, will install an automatic exchange, which it judges will cost about $15,000.

WASHINGTON, Pa.—The State Mutual Telephone Company, which has an underground system installed at Waynesburg, will do considerable conduit work in this city.

CLINTON, Ia.—A ninety mile toll line from Clinton to Cedar Rapids has been erected by the Tri-City Telephone Company, and other extensions are bing considered.

MIDDLETOWN, Ohio.—The Middletown Telephone Company has submitted a set of plans to the Board of Public Service, covering the entire construction of the system.

NEZ PERCE, Idaho.—A new exchange building will be erected in this city by the Nez Perce Co-operative Telephone Company, in which is to be installed its central office.

IDAHO, Ohio.—Connections between Idaho and Latham are soon to be established by the Home Telephone Company, which is erecting a line between these two points.

HEYWORTH, Ill.—The McLean County Telephone Company will rebuild its lines from Bloomington to Heyworth. It will put in new poles, new cross-arms and new wire.

DULUTH, Minn.—The engineering department of the Douglass County Telephone Company is considering plans for the erection of a new exchange building at Duluth.

DEL RIO, Tex.—A new long distance line from Del Rio to Uvalde, Bracket and Eagle Pass is among the extensions planned by the Del Rio & Western Telephone Company.

MOTT, N. D.—The Cannon Ball Telephone Company has secured a right of way through Stark, Hettinger and Adams counties, and has already begun to build its lines from Mott to Richardson.

FAIRBANKS, Alaska.—Among the extensions under consideration by the Fairbanks Telephone Company is the construction of a trunk long distance telephone line from Fairbanks to Valdez.

AUBURN, Ind.—The Home Telephone Company has just erected a toll line between Fort Wayne and Auburn and also one to Angola. Many other improvements are now under consideration.

GONZALES, Texas.—The Gonzales Independent Telephone Company is contemplating extensive improvements in its Smiley exchange. A new switchboard will be installed and some cable work done.

PRAIRIE FARM, Wis.—Among the extensions recently made by the Barren County Telephone Company is a line to Prairie Farm, and the company is now planning for further extensions in its system.

MOLINE, Ill.—The directors of the Union Electric Telephone & Telegraph Company are contemplating the installation of an automatic switchboard. The company will extend to East Moline and Silvis.

TAMPICO, Ill.—The Tampico Farmers' Mutual Telephone Company, which recently refused to make connections with the Bell Telephone Company, contemplates the erection of a trunk line to Rock Falls.

SALTILLO, Mexico.—The Woessner Telephone Company, which will soon be connected with the Durango Telephone Company, will also extend to Torreon, Zacatocas, Montery, Matamoras and other places.

ALMA, Neb.—The Huntley & Mill Creek Telephone Company will erect a new exchange building on First street. The company has been granted a franchise in Alma and will install a telephone system at once.

ST. LOUIS, Mich.—The Union Telephone Company's plans for improvement include the entire rebuilding of its system in St. Louis. It will have a complete cable system installed when the work has been finished.

LUVERNE, Minn.—The Luverne Telephone Company will make extensive improvements in its system, which will result in marked betterment in service. A new switchboard will be installed for long distance and rural lines.

DECATUR, Ill.—The Illinois Traction System is installing a duplicate telephone line between Decatur and Springfield. The company expects to have a duplicate system over all its lines and to install a central station.

CARROLLTON, Mo.—The Stet, Rockingham & Norborne Telephone Company, among its other extensive improvements, will erect a new exchange building at Lebanon, in which it expects to install a thoroughly modern system.

LINTON, Ind.—The New Home Telephone Company, of this place, which also controls the telephone companies at Jasonville, Bloomfield, Worthington, Lyons and Switz City, will spend nearly $40,000 in improvements and extensions.

BEDFORD, Iowa.—General Manager Charles C. Deering, of the Boon County Telephone Company, has announced that his

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company will expend $50,000 on the system in this city, making it the most modern and up-to-date in the state.

ALEDO, Ill.—The Aledo Telephone Exchange Company, which operates line in Millersburg, Joy, Seaton, Hamlet, Viola, Presumption, Sherrard, Cable and other points, contemplates making a number of extensions in its system.

COLUMBIA CITY, Ind.—The Whitley County Telephone Company, the successor to the old Home Telephone Company, and which has a capital stock of $100,000, is planning for a large number of improvements and extensions in its system.

REITZ, Pa.—The Central Telephone Company, which already operates in Forward Reith, Central City, Buckstown and Shanksville, contemplates the erection of additional lines to Hillsborough, Winder, Stoyestown and a number of other places.

CRESTON, Iowa.—The Creston Mutual Telephone Company is making many improvements and extensions in its system. It is estimated that when these changes have been made the company will be able to give service to about 200 additional subscribers.

HUNTINGTON, Ind.—In the new construction work, which the United Telephone Company is planning, it is estimated that about eleven reels of cable, varying in weight from forty-five hundred pounds to one thousand and fifty pounds, will be used.

GRAND RIDGE, Fla.—Among the improvements planned by the Marianna Telephone Company for the establishment of an exchange at Grand Ridge, which will give connections with Marianna, Cypress, Sneads and points over the river as far as Quincy.

TURLOCK, Cal.—The Turlock Telephone Company, which has recently come under the management of John D. Gall, is to expend about $7,000 in the improvement of its plant. New lines are to be built in Turlock and a number of rural lines are to be erected.

SMILEY, Texas.—Among the improvements planned by the Gonzales Telephone Company is the installation of a new switchboard and the stringing of 1,500 feet of cable. The company intends to make its plant in this city thoroughly modern in every particular.

MONMOUTH, Ill.—W. J. McQuiston, manager of the Monmouth Telephone Company, states that his company plans to erect a new office building, install new equipment, with new cables, new switchboards and new lines over the district covered by the company.

CRESTON, Iowa.—Representatives of the different Independent telephone companies held a meeting here for the purpose of planning better telephone service. A number of new lines are planned. Geo. E. Atkinson, of this city, is one of the interested telephone men.

LEES SUMMIT, Mo.—Among the many improvements being made by the Home Telephone Company is the installation of a new switchboard and the erection of new lines. Under the management of W. H. Yankee, the plant is to be thoroughly up-to-date in every particular.

ROCKFORD, Ill.—The directors of the Home Telephone Company have decided to increase the capacity of the system to 4,000, the present capacity being 2,800. New cables will be strung in every part of the city and the system will be improved in every possible way.

ATHENS, Wis.—The Independent Telephone Company, which has expended about $6,000 in improvements this year, is planning the construction of a western line to connect with the Dorchester line, which will give Athens direct connection with Abbottsford, Medford and other places.

KALAMAZOO, Mich.—The Kalamazoo Home Telephone Company is drawing plans for a system having an ultimate capacity of 7,000 telephones, with 3,000 lines equipped. The new company is capitalized at $500,000, of which $100,000 is common stock and the balance preferred.

PORT HURON, Mich.—The Independent telephone managers propose to extend the Independent system through the county of St. Clair, as well as through Wayne, Lapeer, Macomb, Shiawassee, Livingston and Oakland. The Independent company will soon ask for a franchise at this place.

MILWAUKEE, Wis.—Telephone connections over the Independent Telephone Company's wires will run to Madison and through Madison to the southern portion of the state. Plans are now under way for connections between Milwaukee, Appleton, Neenah, Menasha, Green Bay and Madison.

LUTHER, Mich.—A rural telephone company which expects to build lines from Luther to Bailor, Roush and Hoxeyville, is being formed at this city, and the following officers have been elected: H. W. Mitchell, president; Stewart Lacke, vice-president; Fred Lickert, secretary; Frank Rockwell, treasurer.

SOUTH PITTSBURG, Tenn.—The East Tennessee Telephone Company is planning to make many changes and improvements. A new switchboard will be installed, extensions will be made to several suburban lines and a number of new lines will be run to Copenhagen, where there is a demand for many new telephones.

BURLINGTON, Iowa.—The Mississippi Valley Telephone Company is preparing to move into its new exchange building and will probably have the new plant in working order by the first of the year. About five miles of conduit has been laid and new switchboards installed, which will give this company an excellent service.

WHITESBURG, Ky.—The Whitesburg Telephone Company will build a double line from Whitesburg to Big Stone Gap, Va., a distance of about thirty miles, and to make many other improvements in its lines. It is estimated that about $2,000 will be expended on the work. S. H. Fields, Whitesburg, is manager of the company.

SYRACUSE, N. Y.—The Syracuse Independent Telephone Company has under consideration plans for the improvement and extension of its system, which will represent an expenditure of about $150,000. Many new telephones are to be installed, to take care of the company's new business and a considerable amount of new cable is to be laid.

ATLANTA, Idaho.—The construction of a telephone line from Atlanta to Twin Springs has been authorized by the Forest Service. Supervisor E. Grandjean, of Sawtooth National Forest, of Idaho, has had $1,550 placed at his disposal for this work. The line is to be 50 miles in length and will connect four of the granger stations which are now being built.

HIGH POINT, N. C.—The Richford Telephone Company, of High Point, R. F. D. No. 4, which expects to construct, maintain and operate telephone lines through Davidson, Guilford, Randolph and Forsyth counties, has been organized with a capital stock of $2,000, of which $650 has been subscribed. Among the incorporators are D. M. Hayworth, Jacob Mock, J. B. Payne and others.

SANFORD, N. C.—In addition to the ten miles of new lines which it has recently built into Lich Creek section, the Sanford, Jonesboro Telephone Company expects to extend its lines still further into that country. When its proposed improvements and extensions are finished Lee county will be completely covered with an up-to-date rural system, which will give first-class service to all of the farmers in that section.

FRANCHISES AND TRANSFERS.

NEW LONDON, Mo.—Wm. St. Vrain, of this place, has purchased the Center Telephone system.

CROWNPOINT, Ind—The Northwestern Telephone Company is seeking a franchise for an exchange here.

CORUNNA, Ind.—Clyde Wilsey, of Hudson, has purchased the Thomas Telephone exchange, of Corunna.

HAMMOND, Ind—Application for a franchise in this city has been made by the Inter State Automatic Telephone Company.

HASTINGS, Minn.—The Telephone Exchange Company will move its plant to this city and will install new switchboards.

DE WITT, Va.—The Dinwiddie County Telephone Company has received its charter and the construction work will soon be commenced.

OSAGE CITY, Kans.—The Independent Telephone Exchange, of this city, has been sold by Mr. Schwalm to Henry Ziegenbein, of Cameron, Mo.

WINONA, Minn.—The Ettrick Farmers' Telephone Company has been granted the right to enter Galesville and establish a telephone exchange there.

WINDOM, Minn.—The Windom Mutual Telephone Company has sold its exchange at Westbrook to a stock company of the business men of that place.

PILOT POINT, Tex.—The North Texas Telephone Company, which has recently been granted a franchise, will soon commence the construction of its lines.

NORTHFIELD, Wis.—The Northfield Farmers' Telephone Company has been granted a franchise to build lines at this place, which it expects to do this fall.

SPOKANE, Wash.—The board of county commissioners granted to Louis Olson and A. M. Johnson a franchise to operate a telephone exchange in Deer Park.

BRIDGEWATER, Pa.—Application for a franchise to construct and operate a telephone system at this city has been made by the Beaver County Telephone Company.

COVINGTON, Ohio.—The Fitzsimmons Telephone Company is seeking a franchise in this city. On account of the poor service it is likely the company will receive it.

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North Judson, Ind.—John H. Wilkinson, who purchased the North Judson telephone exchange, proposes to put it in first-class condition and extend several lines.

Genesee, Idaho.—At a meeting of the council recently a renewal franchise was granted to the Genesee Telephone Company, of which H. A. Morgan is manager.

Las Cruces, N. M.—The Silver City & Southwest Telephone Company has purchased the Texas & New Mexico Telephone Company's lines between this place and El Paso.

Harlan, Iowa.—A deal has been completed whereby the Harlan-Avoca Telegraph & Telephone Company has purchased the Al A. Lenocker's property, which operates in Oakland and vicinity.

Eatonton, Ga.—The Eatonton Telephone system, owned and controlled by Messrs. Roy D. Stubbs and Henry D. Spivy, has been sold to John G. Spivey. The system controls 300 telephones in the city.

San Diego, Cal.—A petition has been filed with the county board of supervisors by E. W. Scripps for a franchise to construct, maintain and operate a telephone system from San Diego to Miramar.

Tempe, Ark.—The Tempe Telephone Exchange, formerly owned by C. A. Goodwin, has passed into the possession of Sanichas Brothers, of Phoenix, whose purpose is to materially improve the system.

Twin, N. H.—The plant of the Twin Mountain Telephone Company has been acquired by W. C. Leonard, of Whitefield, who intends to build a connecting line between Twin Mountain and the Whitefield exchange.

Butler, Mo.—Henry Reinheimer has been granted a franchise to operate a telephone system in this city for the term of ten years. Mr. Reinheimer will thoroughly equip his plant with modern and up-to-date telephones.

Princeton, Ill—At the recent meeting of the Bureau County Telephone Company, held at Bureau township, it was decided to apply to the city council of Princeton for a franchise to install and maintain a telephone system in that city.

Norfolk, Va.—The corporation commission has issued a charter to the Planters' Telephone Company. J. G. DeBaun, president; J. E. Hall, vice-president; V. Engel ,secretary; C. M. Williamson, treasurer. The capital stock, $5,000.

Milan, Ind.—The property of the Milan Telephone Company, formerly owned by J. H. Connelley, has been acquired by O. M. Bowers, the consideration being $750. Under the new management the plant will be materially improved.

Redlands, Cal.—The principal place of business of the Coachella Valley Home Telephone Company has been removed from Redlands to the town of Thermal, in the Coachella Valley. F. E. Dudley, president; R. H. Meyers, secertary.

Braymer, Mo.—The exchange of the Braymer Telephone Company has been sold by S. F. Brady to the Peoples' Mutual Telephone Company, together with all lines, accounts, etc., and was consolidated with the Burnett system Nov. 1st.

Kanawha, Iowa.—The local telephone lines in Britt, formerly owned by the Western Electric Company, including the rural lines, have been bought by Geo. W. Mason. He has leased them to the Hancock County Rural Telephone Company.

Tobaccoville, N. C.—A charter has been granted to the Doesler Telephone Company, of Seward, Forsyth county. Its purpose is to build and operate a telephone system in Forsyth county. Capital stock, $9,000. Incorporators: A. E. Shore, J. A. Ball and R. M. Daub.

Petersburg, Ind.—A deal was closed at Ogden by which the Interstate or Ogden Telephone Company sold the plant to William Wilgis, of Lafayette, Ind. The system was valued at $35,000, and the company received 690 acres of Starke County land valued at the same amount.

Vermillion, S. D.—At a recent meeting of the city council, ex-Governor Andrew E. Lee was granted the telephone franchise for Vermillion. It is not known when he will begin the construction of a telephone exchange in opposition to the North-Western Telephone Company.

Brownstown, Ind.—The Brownstown Telephone Company has applied for a new twenty-five year franchise in this city. The company has plans under consideration for extensive improvements in its plant, and for this reason desires the terms of its present franchise extended.

Binger, Okla.—A charter has been granted to the Oakdale Telephone Company to construct a line from Swan Lake to Binger. Following are the directors and officers: M. Bradstetor, president; Chas. C. Kime, secretary; S. T. Otey, W. A. Thompson and Walter Cook, all of Binger.

FINANCIAL.

Bruce, Ill.—The Bruce Mutual Telephone Company has increased its capital stock from $2,500 to $5,000.

Silver City, N. M.—The Grant County Telephone Company has increased its capital stock from $35,000 to $60,000.

Ft. Wayne, Ind.—The Home Telephone Company is paying out a 3 per cent semi-annual dividend on its common stock.

Albany, N. Y.—The directors of the Albany Home Telephone Company have paid the regular quarterly dividend of 1 per cent.

Hampton, S. C.—The Carolina Telephone Company has formed a stock company, capitalized at $25,000, with $6,000 paid in. The controlling stock is owned by J. Reid Pitts.

Plattsmouth, Neb.—The Plattsmouth Independent Telephone Company has raised its capital stock from $100,000 to $300,000. The object of increasing the capital stock is to improve the system, especially the toll service.

Marquette, Mich.—A mortgage which provides for the issue of $25,000 worth of bonds, has been filed by the Marquette County Telephone Company. These have been issued for the purpose of enlarging and improving the company's plant.

Warrensburg, Mo.—The Johnson County Telephone Company has paid over $10,000 in dividends in the last three years and set aside $5,000 in the depreciation fund. The company is retiring some of its stock and will issue bonds instead.

Monroeville, Ind.—The Monroeville Home Telephone Company is this year paying 8 per cent on the investment and rapidly making extensions which consist mainly of farm lines. It has recently purchased the exchanges at Wolcottville and other points north.

Muncie, Ind.—The Delaware & Madison Telephone Company, of this city, which owns the exchanges at Anderson and many other points in this vicinity, has paid a semi-annual dividend on its capital stock of $500,000. The company has been doing remarkably well since George W. Beers took active charge of its management.

MISCELLANEOUS.

Macomb, Ill.—The Illinois Western Telephone Company, whose headquarters are in this city, suffered a considerable loss through fire.

Catasauqua, Pa.—The building occupied by the Consolidated Telephone Company's exchange was destroyed by fire Oct. 4. Loss, $4,000.

Butte, Mont.—William McConnell and others are interested in the matter of building a new telephone line for the Fergus county ranchmen.

Greenview, Ill.—The seven telephone companies at this place are considering a plan for the consolidation of the different systems into one company.

Camrbidge City, Ind.—The Citizens' Telephone Company is making an effort to put its plant on a co-operative basis. The company is one of the largest in Indiana and now has more than 1,600 subscribers.

St. Peter, Minn.—A second telephone exchange for St. Peter is being planned and it is possible that the Nicollet County Telephone Company, which has had a monopoly of the field, will have competition. B. Woodbury, representing an eastern syndicate, has charge of the work.

St. Catherines, Ont.—After Nov. 11th the Bell Telephone Company will cease to do local business in the territory of the Dunnville Consolidated Telephone Company. This includes the whole county of Haldimand, the townships of Caistor and Gainesboro, in Lincoln, and a portion of Wainfleet in Welland.

Los Angeles, Cal.—The Union Home Telephone Company's interests have been combined with those of the United States Long Distance Telephone Company. J. M. C. Marble, president of the Union Home Telephone Company, has resigned and Frank W. Wachter has assumed the management of both corporations.

Howell, Mich.—Final arrangements for the consolidation of the Livingston Home Telephone Company and the Inter-State Long Distance Telephone Company, which is capitalized for $15,000,000, of which $10,000,000 is 6 per cent preferred and $5,000,000 common stock, have been completed. The new company is to be known as the Inter-State Long Distance Telephone Company and the directors are: Hugo A. Koehler, E. A. Foster, S. B. Jefferies, of St. Louis, Mo.; Fred Moran and Wm. Barbour, of Detroit; R. B. McPherson, Howell and others. About $750,000 has been appropriated for immediate developments.

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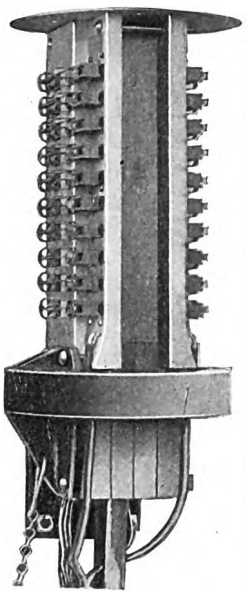
A WINNER

Type F



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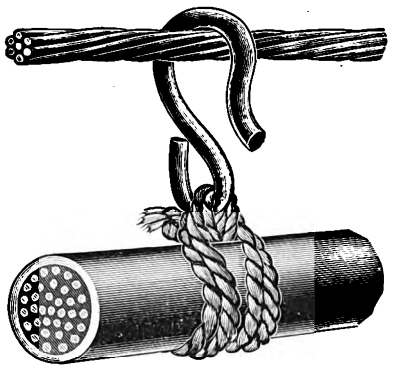

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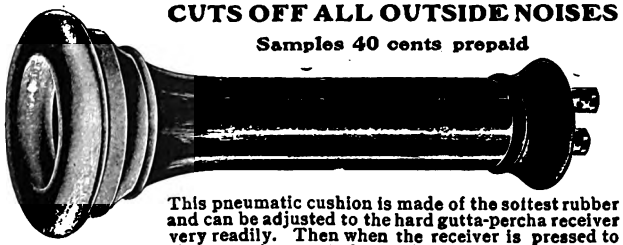

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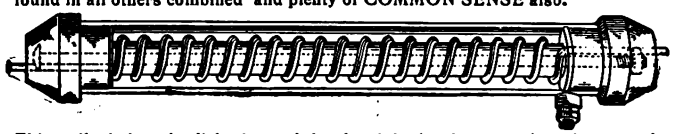

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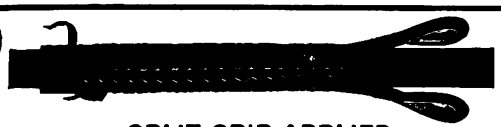

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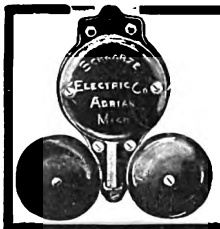

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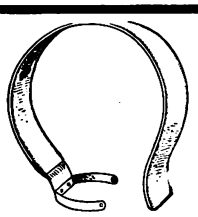

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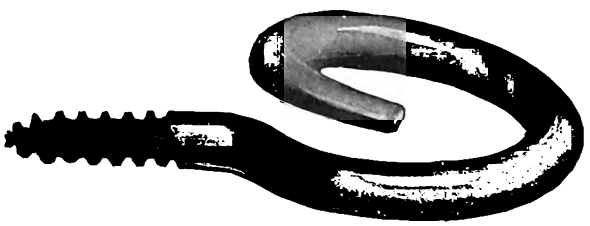

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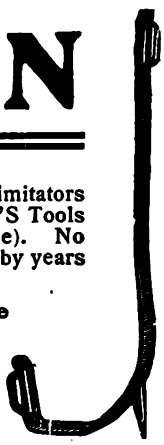

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SOUND WAVES

VOLUME XIV
No. 7

INTERNATIONAL TELEPHONE JOURNAL

DECEMBER
1907

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CHICAGO, DECEMBER, 1907

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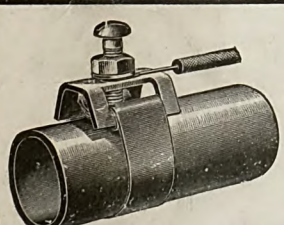

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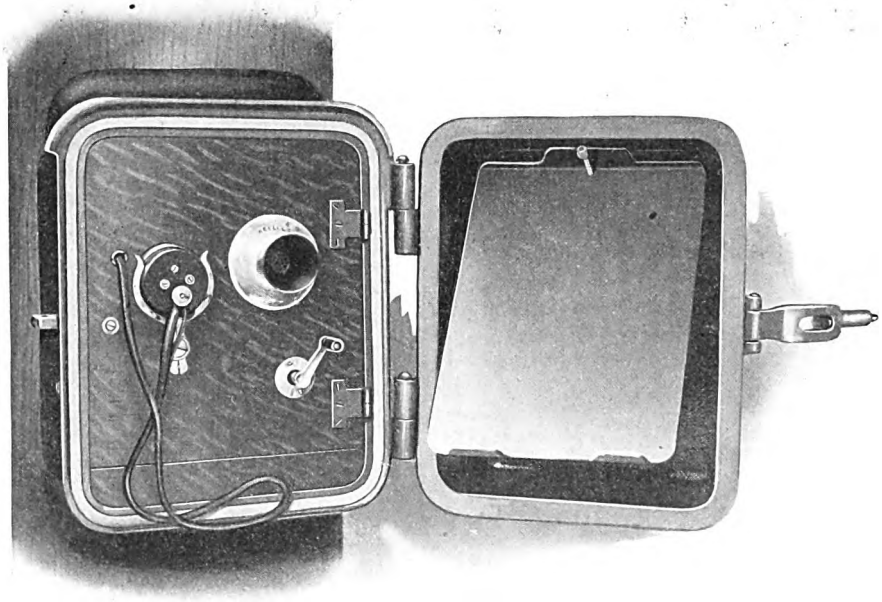

New Railway Pole Set

After many months careful and exhaustive experimenting the Kellogg Switchboard & Supply Co. has perfected and put on the market a Railway Pole Set for all styles of steam, electric and interurban lines that is declared by veteran trainmen to best meet the severe conditions of railroading.

Such a set requires freedom from interference and must be of such strength that a wandering tramp cannot destroy it, or some impatient switchman batter it in with a link or a pin.

Built to overcome the faults of older styles, it combines strength, simplicity and ability to do the work required.

And not only work well, but under adverse conditions.

The worst storms can not affect it and trainmen know what it means to have a car stalled on a far off siding, when no order can be received—because the telephone out on the pole has broken down.

The new Kellogg oak set is inclosed—although instantly removable—in a strong, absolutely weather proof, malleable iron box. This is built as light as requirements warrant.

By this arrangemnet the iron box may be sent ahead with the construction gang, and placed upon the pole.

Later, the telephone man can pass along and insert the oak set within the iron box, connect it quickly to the outside circuit, and be ready for operation.

Two screws hold the oak set in place. If it is desired to remove the set, the active parts contained within the wood box can be taken out intact in a moment's notice.

The malleable iron outer case is 16 in. high, 12¾ in. broad and 12½ in. deep, over all, and is easily adjusted to the pole.

The front opens on strong hinges, and on the inside contains a folding writing shelf which pulls forward into place without effort. This outer door can be securely locked and closes upon rubber gaskets which guarantee protection from moisture.

The bells are protected by a heavy hood provided with weather proof openings which allow the sound from the ringers to be heard at a considerable distance.

The telephone proper is fitted with watch case receiver, irmly held on patent hook-switch, and a protected transmitter. The interior parts are securely fastened in place.

The set is arranged for the local railroad company's switch lock and key.

The handle of the magneto generator is conveniently placed so it will not interfere with the opening or closing of the door, or with the removal of the receiver from the hook.

Another point of superiority is that the set is easily accessible. To this end, the get-at-ability of the instrument is made dependent upon a single screw in the door of the oak set, which cannot be lost. The generator, ringer, induction coil, and dry cells are within easy reach, and can be replaced without disarranging a single wire or contact.

Other devices up to the present time have to be completely dismantled to make repairs. With this set, the oak box can be easily removed, replaced by a new one, and the old one repaired on the ground or at the home office, if necessary.

It is equipped with the justly famous Kellogg transmitter, the peculiar construction of which gives strength and quality of voice current, and causes voices to be easily recognized. Most transmitters give loudness without clearness. The front diaphragm action gives both. The quality of carbon used guarantees long life, as records show tens of thousands of Kellogg transmitters in use six full years without a particle of attention.

The Kellogg magneto generator with which this set is fitted deserves the high reputation it possesses. It retains its magnetism and the construction makes it remarkably free from burn-out, due to lightning and static effects. If desired, however, an arrester is placed within the box.

The Kellogg hook-switch is easily accessible and its record for durability and length of service is unquestioned.

That this set will be operative, hot or cold, wet or dry, with the least expense and with the least amount of attention is the belief of every man who has examined it.

For mining operations or the temporary camp of the lumberman, this set fills a long felt want.

It stands rough handling and is at all times ready for service.

Like other Kellogg apparatus, it is the "Standard of Excellence."

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SOUND WAVES

International Telephone Journal

VOL. XIV CHICAGO, DECEMBER, 1907 No. 7

ISSUED THE FIFTEENTH OF EACH MONTH BY THE

ELECTRICITY MAGAZINE CORPORATION

1253-4 MONADNOCK BUILDING, CHICAGO.

ED. J. MOCK, Editor. F. M. BAILEY, Advertising Director.

TELEPHONES: HARRISON 1521; AUTOMATIC 2904.

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Requests for change of address should be made two weeks in advance, giving *old* as well as new address.

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Entered as second-class matter April 22, 1907, at the Postoffice at Chicago, Illinois, under the Act of Congress of March 3, 1879.

NOTICE TO ADVERTISERS.

Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisement can not be shown until the appearance of the edition containing it.

The publisher of SOUND WAVES *guarantees the advertiser a minimum circulation of 5,000 copies each month.*

CHICAGO, DECEMBER, 1907.

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GRANGE ENDORSES COMPETITION.

LOOK FOR THE SHIELD

THE Grange is one of the most substantial organizations in the United States. It wields an influence that is formidable as a teamster's union and yet so little is heard concerning it that we scarcely realize that it exists. No one but a farmer can belong and the members use the order in such a mild manner that its function seems to begin and end with the annual summer picnic of the local lodge.

There are a million members—every one a farmer, mind you—and nearly every member the head of a household and the lord-protector of a bunch of real estate, not listed, either for sale or for mortgage.

The National Grange is merely a perfunctory affair by comparison, but it has behind it the full membership of the Grange. The National order is the executive branch of the big auxiliary. Each state sends two delegates to the annual convention which met November 9, this year, at Hartford, Conn.

The following is one of the resolutions that was referred to the proper committee and by it reported favorably and unanimously passed:

The National Grange having, in the past, opposed monopolies of any and every kind and a telephone monopoly in particular, your committee desires to call your attention and it is with pleasure we note the immense increase in the number of telephones in use among the farming communities and especially where competition is most active.

We find the service is better, rates lower and the number of telephones greater under competition than under monopoly, and therefore recommend the passage of the following resolution:

Whereas, The telephone has become a public convenience and necessity, which should be installed in the home of every farmer, we wish to go on record as favoring telephone competition as the only means whereby we can receive the best telephone service at the lowest rates.

We condemn any law that fosters a monopoly in the telephone business as against the best interest of the members of the Grange and the people generally, and call upon the members of the different organized bodies, members of the legislature in the different states, members of the house of representatives and senate in congress convened, and the President of the United States, to use their best endeavors to allow free competition and permit the people of this nation to buy telephone service when and where they please.

We condemn any law or method whereby the people must pay tribute to a monopoly for a necessity of life and are opposed to the United States government making exclusive contracts with any telephone company, and call upon each and every member of the Grange of the different states to use their best efforts to see that laws are enacted and men elected to public office that will give us active competition in the telephone business.

[Signed] A. O. JONES, of Indiana,
G. W. BAIRD, of Minnesota,
T. C. ATKESON, of West Virginia.
Committee on Resolutions.

The resolution was offered by Mr. W. F. Hill of Pennsylvania, and because of the magnitude of the organization he represents, it must be conceded that this is one of the hardest single jolts that has been dealt to telephone monopoly for some considerable time.

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THE DISTRICT MEETINGS.

WHEN the Independent telephone operator hit upon the scheme of holding district meetings, he discovered something really worth while. One of the best Independent telephone meetings ever held in this country was that of the Michigan Managers at Battle Creek. It was a genuine love feast. The discussion was confined to the subjects with which the members were thoroughly conversant—the material, necessary, every-day problems. There was no time for theories, or resolutions. There was absolutely no room for anything except the immediate program and it was meaty all the way through.

A similar meeting was held only a little while ago at Washington, Ohio, when the managers of southern Ohio convened in the Business Men's Club. It would be hard to find a better place to hold a meeting of Independent managers than in a business men's club, for the manager must be nothing other than a business man. He is the man on the job and his success in the Buckeye state is an open book.

Without the district meeting, the state conventions would fall flat. The interest aroused locally, brings out the real talent from the live men who know and they proceed to the larger meeting with the fire of enthusiasm necessary to inspire the best effort in their brothers.

The state conventions have grown larger and better from year to year, some of them almost equalling the national event. And there is reason why they should. The business of the International Association should be purely executive. It should be the clearing house for the states—a headquarters for statistics, records and details. The International convention should be a great glad-hand affair.

The place for the serious business is in the district meeting—a fact that becomes more and more apparent as the telephone systems multiply.

Are we seeking peace, or is the fight to go on?

BELL TO BUY WESTERN ELECTRIC.

ON the first day of November, 1907, the American Telephone and Telegraph Company, New York, made an agreement with the Merchants Loan and Trust Company, Chicago, which is in perfect harmony with Bell traditions. The document blandly sets forth the proposal of the A. T. & T. Co. to buy the Western Electric Company outright with any old thing but real money.

It is a great levelling offer.

If you have been chesty in the belief that your Western Electric stock was intrinsically worth 400, just lie down somewhere in a nice soft spot and have the kinks ironed out of you. The Octopus has said it is worth exactly 225, and what is more, it is just what you are going to get, and in "cleaning house" certificates at that. We use the term advisedly, for the ultimate offer is A. T. & T. stock at 134¼—stock that will be lying around conveniently for just such an emergency.

The present market quotation on A. T. & T. is 103, or thereabouts, but that doesn't matter. The proper thing to do, if you have Western Electric stock at all, is to take it to the trust company, sign it in blank and get a receipt which will be redeemed the middle of next October by the A. T. & T. at 250 in convertible 4s, or cash at 225—at the option of the buyer!

The following considerate little suggestion stands out conspicuously as an introductory sentence in a new paragraph, which you will please underscore: "It is presumed that payment will be made in bonds."

The bonds you will take are to become due in 1936, but you can exchange them at their face value between March 1, 1909, and March 1, 1918, if you chance to think of it, for A. T. & T. stock at the rate of about 134¼% on the par, whatever that means.

This much is clear to the man who doesn't have money in W. E. stock. It is worth far more than 225. It pays 8%, but earns much in excess of that. A. T. & T. needs the money—it always needs it. It had one of the times of its life selling the last bond issue and every financier of moment boosted the game for all it was worth with poor success. Even J. P. Morgan, big enough to do the impossible in other crises, could not master Bell bonds. The present example will show Morgan where he gets off. The Bell is the best booster for Bell bonds. If you don't like 'em, 'ere's a 'elping, anyway.

The Bell fixed up an industrial in Western Electric which was good enough to buy and the people bought. These purchasers will now see their money passed along to the telephone trust. There is no help for the victims, because A. T. & T. has a cinch and Independents know what that means, whether W. E. stockholders know it or not.

Violent abuse of power is generally the means of calling the right of it in question.

WHICH?

HAVE you forgotten that the subsidiary Bell companies over-indulged in specifying the amount of apparatus to be used last year and that the Western Electric Company started off January last with something like $10,000,000 worth of "telephone supplies" in stock?

Do you remember that at the end of the first half of 1907, the gross receipts of Western Electric Company were $1,000,000 less than for the same period last year? And you possibly recall that only last March, in a single month, between 2,500 and 3,000 men were dropped from the W. E. payrolls.

Would these incidents betoken the need of the Bell entering into general competition as a manufacturer, as well as an operator? Would it not suggest a campaign of price cutting—a piratical warfare to regain lost prestige?

These are pertinent query reminiscences. SOUND WAVES has seen certain price quotations, made by the Bell trust, which have a peculiar way of evading the Independent manufacturer. Look out for jokers! We have asked the Independent manufacturer some pointed questions and have learned from him that he is ready to meet the Bell so far as price is concerned—the price he has knowledge of.

That he can supply a grade of apparatus far superior to the Bell article has been proven for many years. The test of time has demonstrated the high efficiency of Independent apparatus. The element of competition has brought forth the greatest economical development. Progress has marked the evolution of manufacture.

During the early part of this year there was a great deal of loose talk floating about that sentiment in the telephone business was a back number and that service must be the watchword henceforth. If there ever was a time for sane men to determine between sentiment and service—now is the time. Service must depend upon

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apparatus and supplies and if price means anything to the operator, he will fight for it and place his order with the Independent manufacturer or supply dealer. If sentiment governs the business, the matter of price and inefficient apparatus will not enter into the subject.

Is it sentiment or service?

"The harder the conflict, the more glorious the triumph."

THE TRADE INDICATORS.

IT would be rare, indeed, to find an industry that had not felt the sting of the recent money panic. We are led to pass judgment by the things we come in contact with from day to day. We are publishers of a class journal and our exchanges are other class journals. We know of no barometer which better reflects the condition of an industry, or the spirit of the times, than the trade paper. There is no indication in our numerous exchanges that retrenchment in advertising is a part of the program of the industries they represent. In view of all the beautiful things the telephone press has preached about the permanency of the telephone, there should be a great rally to the advertising pages by those manufacturers who seriously entertain the spirit of their convictions.

You hear of no failures among telephone operators. There are a myriad of items in this issue of SOUND WAVES, culled from reliable sources and covering the entire country, which show that the telephone business is marching steadily onward. Orders are straggling along, rather timidly no doubt, but the telephone business hasn't changed overnight and it will not. There is much business to be had and the way to economize right now is to plan for next year's orders. There is nothing like advertising as a healthy stimulant, and the telephone business need not be ashamed of those papers which guide the way between operator and dealer.

Would that we might become reconciled with our Independents.

A SUGGESTION.

IT is a common practice for the exchange operator to insist on a simon-pure, blown-in-the-bottle type of Independent apparatus and then use less discrimination in making his other purchases. In other words, he has conducted his campaign for business on a basis of sentiment and must make good with the proper display of name plates.

He isn't usually so particular in selecting other materials. There are numerous supply houses and auxiliary dealers in telephone accessories who have shown by their willingness to contribute to the state and International associations that their sympathies are with the Independent movement. They should have the preference when an order is placed, but they get it only when there is some inducement in price.

To emphasize this point, right now the state associations are meeting, offering and passing resolutions which bind the members to use only Independent apparatus and to maintain no Bell connections. This is good as far as it goes and it is expected that the International convention, to be held in Chicago January 21-23, 1908, will pass a similar resolution.

As a suggestion for the supply dealer, the pole dealer and the allied trades, which contribute to the association and its press, let the resolution read something like this:

Resolved, that the members of the International Independent Telephone Association unanimously agree that they will not purchase or use nor connect with any company which uses *telephones, switchboards, equipment, line materials or supplies* made by the Western Electric Company, and any member so doing shall be immediately expelled from the association.

Such a resolution would at least be fair to the large interest which has become affiliated with Independent telephony. It appears to be broad enough to cover every phase of the industry.

Blind folly and obstinacy sometimes upset the best of us.

AGAIN, THE ASSOCIATION STAMP.

THE shield stamp is either right or it is wrong. There can be no middle ground for it. Originally designed to serve the double purpose as a mark of approval for the telephone manufacturers' product and a revenue producer for the International Association, it has fallen to the level of a farce. The association's statement shows that the stamp was intended to raise a minimum of $6,500 per annum. It also shows, at the end of six months, that it has brought $360!

We have felt all along that the stamp scheme was admirable, but it is evident that the manufacturer is afraid of it. There must be objection that an honest use of the stamp would leave a record of individual sales —something that the manufacturer probably believes should not exist. This is most unfortunate, for it must be remembered that there are no real statistics in Independent telephony. The count must be made at the subscriber's station, rather than at the factory.

We have never had an actual instrument census in this business and probably never will have one. The game has been a great hurrah from the start. Any one can make a telephone and nearly everybody makes them. When one of the most important Independent manufacturing establishments of today was started, its engineer said it would be the policy of the concern to make any thing telephonic that was called for—regardless of patents. This program has been rigidly adhered to.

There might be demand for statistics, consequently there is no occasion to use stamps.

A plan has been offered by a large St. Louis supply house that the stamp be used on each invoice. By such a rule, the supply dealer could use them. The suggestion is sound, because a billing clerk is in the habit of using stamps, while the shipping clerk uses the hammer. It would also bury the count!

But the stamp is good or bad, and the subject should be carefully considered at the coming convention.

There is a discernable feebleness in some of our proceedings.

COPPER, THE METAL.

FRANCIS MARSHALL is president of the Marshall Lumber Company, Grand Rapids, Mich. We first learned of this gentleman through an item which appeared in *Michigan Investor,* an exchange which comes to SOUND WAVES office each week. The item quoted Mr. Marshall as an authority on copper, the metal, but our correspondence would indicate that Mr. Marshall makes no such pretension and never did. In one of his letters he says:

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"Some months ago, when the present depression in copper values began, I was in the Chicago office of a friend of mine who uses a considerable amount of the metal. I told this friend that I believed he would never be able to purchase copper at these low prices.

"Last month, when I was coming through Chicago, I again saw this friend, and he recalled what I had said to him before on the subject and said it had actually come to pass. He told me that he had gone to a broker and offered the market, which he was told was 12½ cents, and placed an order for six cars. He was told that no copper was being sold. Inasmuch as he had to have the copper, he offered up to 15 cents, but was told that they were not receiving orders at any price just then. It was a rather serious situation for him, and, as I knew a Grand Rapids concern who had a quantity of the metal stored, I thought possibly I could help him in his want for a dealer.

"When I got home I visited this dealer. I met with practically the same condition that my friend had experienced in Chicago. I was simply told that the copper was not for sale."

Now what do you think of that! We have blamed copper for a lot of our troubles and had recently made due apology for it, because the price had slumped to normal, but it would seem that there is something pretty raw in the proceedings. Telephones at ten cents apiece would be no incentive to the operator if he offered the price and could get no instruments. The copper fight is still on and while it lasts we shall probably see no change in the stock lists or any improvement in that other disturbance which is now respectfully referred to as "the recent flurry in money."

Let us studiously avoid those things which are personal among ourselves.

COMPETITION IS NECESSARY.

The chief objection urged against municipal ownership of public service monopolies is that political influence rather than merit is likely to govern employment in relation thereto—thus impairing the honesty and efficiency of the service. An offsetting consideration that private ownership and conduct of these privileged monopolies is frequently tainted with the same evil. The subject is wide-open to argument, but if municipal ownership could be worse than Bell ownership as a whole, pray for Canada. The Dominion favors government ownership, municipal ownership—any ownership to Bell. When politics becomes more corrupt than Bell practice in its treatment of the public, we shall be a piteous people. The country is full of examples, but none are more apparent than in those cities where Independents fail to secure franchises. Look at Evansville. The members of Evansville city council, as individuals, may be fine examples of American manhood, but as a civic body they would have a sorry time to prove it before a convention of Independent operators. The aldermen of Cincinnati may not be subservient to Bell interests, but it will take St. Peter's final score to differently convince the Fitzsimmons Telephone Company.

In New England, where the Bell is strongest, there has been more corruption proven against the New England T. & T. Company than a rotten municipality would show in a century. The company operates on long time franchises which are practically exempt from interference of any kind. There is no public regulation of service or rates. It carries its henchman on the permanent payrolls and the salaries come out of the subscribers to an abominable service. Municipal service could not be worse.

The remedy for the evils is dual telephony. The telephone business is peculiarly fitted for competition. Two systems are not cumbersome to the public. Duplication is a small element and is not troublesome.

The Bell has tried for years to cram down the misnomer that the telephone business is a natural monopoly. It's a nature fake! The telephone business will serve the great American public best when it is on a competitive basis. The thing is proven by figures, by practice, by service and by the public. Public service corporations are never quite so bad as when the Bell Telephone Company holds monopoly. Even when it is subject to public regulation it gets the best of it, for city government is always in the hands of the politician and the politician wants nothing better than Bell patronage.

The Bell company when it stands alone in a community will be found "standing in" with the political boss and his gang.

"Time makes more converts than reason."

DEVELOPMENT OF SASKATCHEWAN.

There is little doubt remaining that the province of Saskatchewan will not go into the telephone business on its own account. When Mr. Francis Dagger went from Winnipeg to Regina, it was to conduct an inquiry having for its ultimate the advisability of instituting a government service. He has had the full co-operation of government officials in his efforts to gather data that will be needed to emphasize the needs of competition and only recently his work has been facilitated by a transfer into the offices of the Provincial Railway Commission.

It is expected that upon Mr. Dagger's findings the next legislature will enact laws making possible the actual construction of lines in the spring. The plans that have been outlined at the instigation of the Scott government need only the endorsement of the legislature before trunk lines will be undertaken. In many respects the Saskatchewan plan is like that of Manitoba, where the towns receive government aid, if required to build the local plants, the government itself holding to the long distance business.

"These are the times that try men's souls."

The Ever Obedient Central.

Rural patrons of a telephone system show determination to get all there is in the telephone service and usually keep central busy. A subscriber, writing to Sound Waves, says that a rural subscriber called central and gave the information that at her house there was a fine cake in the course of making, and that it had just been placed in the stove and would central be so kind as to watch the clock and call her when it was time for said cake to be taken out. As central had only about a thousand other things to remember, she accommodatingly kept tab on time and informed the good lady when the cake was done. Central got the lady's thanks, but the manager watched the office door for a week, hoping for something more substantial, but he is still waiting.

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A Graphic Method of Finding the Self-Induction of Generator Armatures.

By Arthur F. Poole.

DURING the past few months, two methods of finding the self-induction of hand generator armatures have been given in this magazine, one by Dr. Wilder in the article "A Study of Telephone Generators" appearing in the April and August numbers, and another by Mr. Smith, entitled "Hand Generator Magnets," in the September number. This last method seems to be wrong in principle, so the results obtained by it are wrong also. Both methods, however, require considerable computing.

In this article, a graphical method for obtaining the value of L is given. It seems to have some advantages over the other methods in that it is more direct and by its use the value of L can be obtained without a tedious numerical computation with the consequent liability of mistake. To illustrate its use, data has been taken from both the previous articles referred to and values of L have been found.

While the method may not be new, its convenience is the excuse for calling attention to it.

When we have a generator giving alternating current to an external non-inductive circuit, we may represent

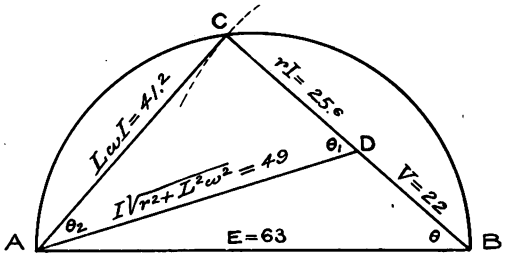

Figure 1.

the various electromotive forces in the whole circuit by a triangle. To take some data given by Mr. Smith in one case,

V = 22 volts.
E = 63 volts.
I = .050 amp.

When E is the voltage on open circuit, V the voltage around the non-inductive resistance, and I the current strength.

In Figure 1 draw A. B. = E = 63. On A. B. as diameter, draw a semi-circle A. C. B. The voltage drop due to the resistance r of the armature is r I or 515 × .050 = 25.75. Since this is in phase with V we can add it to V and get as the total drop due to the resistance 47.7. With 47.7 as a radius, draw an arc from B as center, cutting the circle at C. Draw A. C. which will be the third side of the triangle. The sides of this triangle are therefore E, v+rI, and LωI where L is the self-induction and ω, 2π times the frequency.

The equation for a current in a circuit containing resistance and self-induction is

$$I = \frac{E}{\sqrt{(R+r)^2 + L^2\omega^2}} \qquad (1)$$

where R is the external resistance.

By a simple algebraic transformation this becomes

$$I^2(R+r)^2 + I^2L^2\omega^2 = E^2 \qquad (2)$$

or the equation represents the relation between the sides of a right angled triangle whose hypothesuse is E and sides I (R + r) and I L ω. The triangle A. B. C. is right angled at C since it is inscribed in a semi-circle.

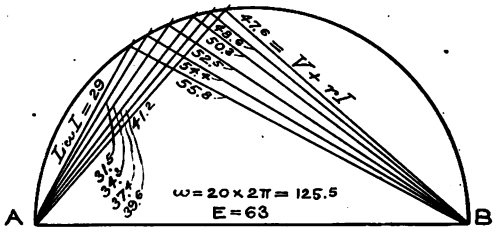

Figure 2.

V	I	rI	v+rI	LωI	L
22	.050	25.6	47.6	41.2	6.6
25	.046	23.6	48.6	39.6	6.8
30	.040	20.3	50.3	37.4	7.4
35	.034	17.5	52.5	34.3	8.
40	.028	14.4	54.4	31.5	8.9
45	.021	10.8	55.8	29.	11.

A. B. is equal to E and B. C. equal to I (R + r) or V + rI by construction. Therefore A. C. is equal to I.

To find L, one has but to measure A. C. and divide the length by ω I. In the figure LωI is 41.2.

$$\frac{41.2}{125.5 \times .050} = 6.6$$

In Figure 1, lay off C D = r I = 25.6. Draw A D. The triangle A D C gives the forces in the armature

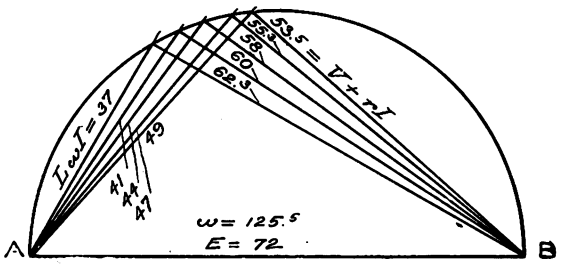

Figure 3.

V	I	rI	v+rI	LωI	L
30	.046	23.5	53.5	49.	8.5
35	.040	20.3	55.3	47.	9.3
40	.035	18.	58.	44.	10.9
45	.029	15.	60.	41.	11.2
50	.024	12.3	62.3	37.	12.3

itself—and A D, or 49, is the volts lost in the armature. This figure shows the error in the method given by Mr. Smith. He overlooked the fact that the E. M. F. lost in the armature is not in phase with the E. M. F. in the non-inductive resistance. So their difference is a vector difference, not an algebraic one.

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In Figures 2, 3, and 4 are some examples of the application of the method. The data was taken from Figure 5, which is a reproduction of Figure 2 on page 150 of Mr. Smith's article. A particular value of V was taken on a curve and the corresponding value of I was taken. This value of I was multiplied by 515, the resistance of the armature, and added to V, thus giving the length of the side $V + rI$. This side was then drawn and L found by dividing the third side of the triangle by $I\omega$.

Figure 2 is from curve No. 1, Figure 3 from curve No. 2 and Figure 4 from curve No. 3. It will be noted that the values of L so obtained do not agree among themselves. It does not seem probable that the self-inductance of the armature should vary so widely. The error is more likely to be in the curves given by Mr. Smith. It will be noticed that curves 1, 2 and 3 in Figure 5 are straight lines. Mr. Smith in his article (bottom of page 151) says, "If the curve is a straight line both the impedence Z and the reactance X will be constant." This statement is true only when the impedence Z is zero. When there is any reactance the line will be a curve as is easily shown as follows:

In Figure 1, let angle $ABC = \theta$

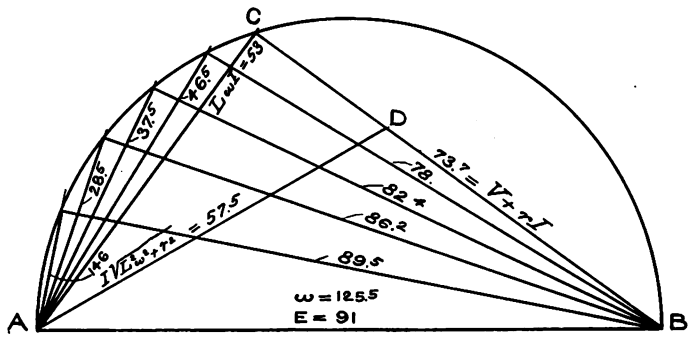

Figure 4.

V	I	rI	v+rI	LωI	L
87.5	.004	2.0	39.5	14.6	29.
80	.012	6.2	86.2	28.5	19.
70	.024	12.4	82.4	37.5	12.
60	.035	18.	78.	46.5	10.6
50	.046	23.7	73.7	53.	9.2

Then

$$V + rI = E \cos\theta \quad (3)$$
$$L\omega I = E \sin\theta \quad (4)$$

Eliminating the variable angle θ from these equations by squaring both and adding, remembering that $\sin^2\theta + \cos^2\theta = 1$ we have

$$(L^2\omega^2 + r^2)I^2 + 2rIV + V^2 = E^2 \quad (5)$$

This is the equation of an ellipse, it is the equation of a straight line only in the case of $L = 0$. Then the first number is a perfect square and reduces to

$$V + rI = E$$

It will be interesting, however, to plot some values of I and V found from equation (5) on the assumption that the self-induction L is a constant and see how much the curve thus drawn varies from a straight line. Let us take the worst case, that of curve No. 3 in Figure 5, the one whose values of self-induction vary from 9.2 to 29 as shown in Figure 4. Let us see if the curve formed by assuming different values of I, finding the corresponding values of V and plotting the curve from the values thus obtained differs much from curve No. 3 in Figure 5. If it does not, it will make it probable that the different values of L obtained in Figure 4 are not correct, but that the discrepancies come for errors in the observations themselves.

Solving equation (5) for V we get

$$V = -rI \pm \sqrt{E^2 - (L^2\omega^2 + 2r^2)I^2} \quad (6)$$

Now we could take different values for I, substitute them in equation 6, and if we made no mistake in our computing and were patient we would get the value of V.

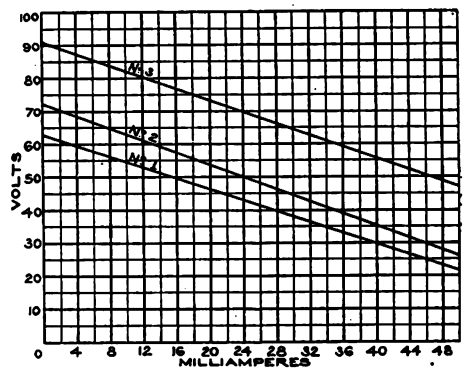

Figure 5.

However, there is a graphical method of solving this equation which will give us V by simply measuring the length of a line.

In Figure 6 draw A B = 91 = E
B C = 73.7 = V + r I
A C = 53 = L ω I

these values being taken from the triangle A. B. C. in Figure 4. On B C measure from C, C D = 27.7 = r I, and draw A D. With A as center and radius = 91 = E draw arc B B'. Now A C = LωI = 53, therefore $L\omega = \frac{53}{.046} = 1{,}150$. Assume a different value of I, say I', multiply it by 1,150 and lay off the result on A C from A. Say C' is such a point. Draw a line from C' parallel to C B until it intersects the arc B B'. Then

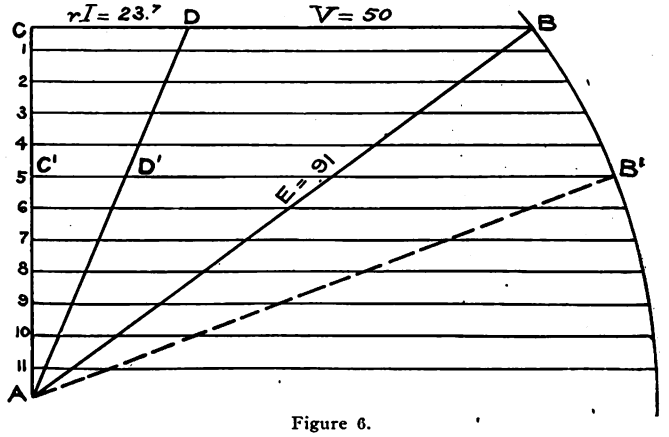

Figure 6.

I	LωI	V
1.44	50.8	53.
2.40	46.1	57.2
3.36	41.5	62.
4.32	36.9	66.5
5.28	32.3	70.5
6.24	27.7	74.
7.20	23.1	77.5
8.16	18.5	80.5
9.12	13.8	83.7
10.8	9.2	86.5
11.4	4.6	89.

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D′ B′ will be the value of V, corresponding to the current I′. The proof of this is simple; in the triangle A B′ C′ right angled at C′. A B′ = E and A C′ = L ω I′ by construction. Therefore B′ C′ = V + r I′.

But cotangent of angle C A D $= \frac{L\omega I}{r I} = \frac{L\omega I'}{r I'} = \frac{A C'}{C D'}$, since L and r are constants. A C′ = L ω I′ by construction, therefore C′ D′ = r I′ and B′ D′ = V. So that if we lay off on A C different values of LωI and draw lines through such points lines at right angles to A C the intercepts of the lines between the arc B B′ and the line A D will be equal to the corresponding values of V.

A table of the different values of V and I thus obtained is given and in Figure 7 they are plotted to

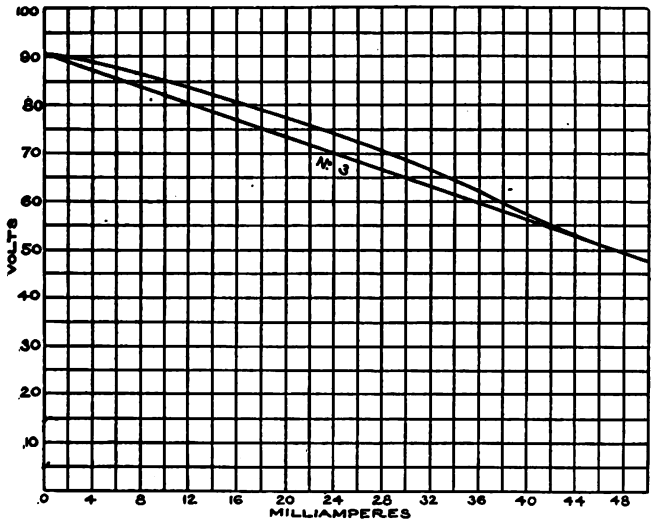

Figure 7.

N	E / 6.035N	R	I	ω / 2πN	Lw	I / L1	L2	Lw − L1	dL	di
5.76	34.76	1630	.0205	36.18	25.0	12.93	12.91	12.07	2.	.0002
9.10	54.92	1630	.0302	57.18	11.0	14.00	14.10	—3.10	3.09	.0013
10.75	64.88	1630	.0367	67.54	8.4	10.14	10.13	—1.73	.77	.0004
13.	78.46	1630	.0439	81.62	7.8	9.00	8.98	—1.18	1.91	.0017
15.8	95.35	1630	.0512	99.27	6.52	9.10	9.07	—2.55	1.81	.0024
11.25	67.90	3019	.0212	70.68	19.30	15.10	15.12	+4.18	4.19	.0006
15.3	92.34	3019	.0293	96.13	12.40	9.40	9.40	+3.	1.51	.0007
24.2	146.5	3019	.0452	152.	8.97	7.40	7.56	+1.57	3.51	.0026

L, computed by formula $L_1 = \frac{\sqrt{E^2 - R^2 I^2}}{\omega I}$ Man = 10.91.

L$_2$ computed by formulas (a) $\cos\theta = \frac{R I}{E}$
having found θ from (a)
L$_2$ is found from $L_2 = \frac{R \tan\theta}{\omega}$

form the upper curve. The straight line will be recognized as curve No. 3 from Figure 5. The difference between the two curves in no place is over 5 volts or 4 milli-amperes. So one can see when getting the self-induction from observations of small current values how a small error in the observations will make such a large error in the derived value of L.

In the April number, the article by Dr. Wilder gives an instance of this same error. A table of the values of the self-induction of a generator armature was given and curves drawn (Figure 2, page 167) to illustrate how L changed with the change of speed of the armature. At the bottom of page 168, Dr. Wilder gives a table of these values of L in which L varies from 25. to 6.52. This table was computed according to the formula.

$$L = \frac{\sqrt{E^2 - R^2 I^2}}{\omega I} \text{ where } \omega = 2\pi N.$$

None of the values of L given by this table can be obtained from the data. A mistake has evidently been made in computation. The table below gives the correct values.

In this table N = number of revolutions.
E = 6.035 N, since the generator gives 6.035 volts per revolution.
R = resistance of armature + resistance of volt meter used in test.
I = value of current given.
ω = 2 π N.

L_1 = value of L by formula $L = \frac{\sqrt{E^2 - R^2 I^2}}{\omega I}$

L w = value given by Dr. Wilder.
L w − L_1 = difference between two values.

There is a formula which is much more convenient for use than that given. It employs the angle of lag θ.

We have

$$\text{Cos. } \theta = \frac{R I}{E} \qquad (a)$$

$$L = \frac{R \tan\theta}{\omega} \qquad (b)$$

First find cos. θ by equation (a), then take value of tan θ from the tables and use in (b). A set of values of L computed by this method is given in column L_2. They agree with those in L_1 within the limits of neglected decimals.

These values of L vary from 14. to 7.40. As before, it will be interesting to find if possible errors of observation will not explain the variation. Instead of plotting a curve as was done before, it will be more convenient in this case to differentiate the formula (a) and (b) regarding L and I as variables.

$$\text{Cos } \theta = \frac{R I}{E} \qquad (1)$$

$$-\sin\theta \, d\theta = \frac{R}{E} d I. \qquad (2)$$

$$L = \frac{R \tan\theta}{\omega} \qquad (3)$$

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$$dL = \frac{R}{\omega \cos^2 \theta} d\theta \qquad (4)$$

Substituting value of $d\theta$ from (2) gives

$$dL = -\frac{R^2}{E \omega \cos^2 \theta \sin \theta} dI \qquad (5)$$

Substituting value of $\cos^2\theta$ from (1) gives

$$dI = -\frac{I^2 \omega \sin \theta}{E} dL \qquad (6)$$

The mean of all the values of L_1 is 10.91. In column d L is given the differences from the mean value.

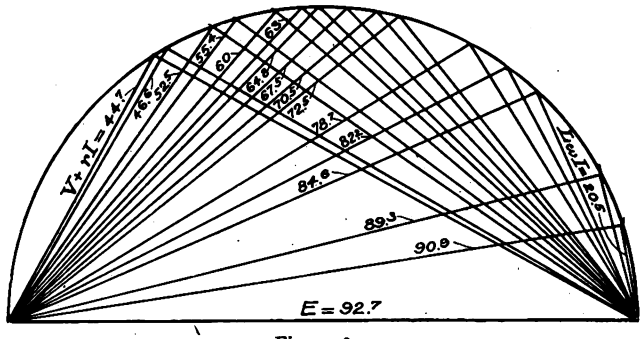

Figure 8.

Taking values for d L the values of dI as computed by equation 6 are given in column dI. As they never rise above 2.4 milli-amperes, it seems probable that errors of observation will account for the difference in the values of L. Of course, the fact that the generator wave form is not a pure sine wave will make a difference (since all the formulas given assume a sine wave), as will the fact that a coil was measured containing iron. But these factors will not make variations of 100 per cent as is in some of the results. Getting the self-induction from small current values is the cause of most of the variation.

In conclusion, I give in Figure 8 some values of L derived from data given in Figure 10 of Dr. Wilder's article published in the July number. This Figure 10 is reproduced here as Figure 9. It will be seen that as long as θ is between 30° and 60° the values of L obtained agree fairly well. Of course the middle values are most accurate, as can be seen from the construction of the figure. The mean of six middle values is 6.08.

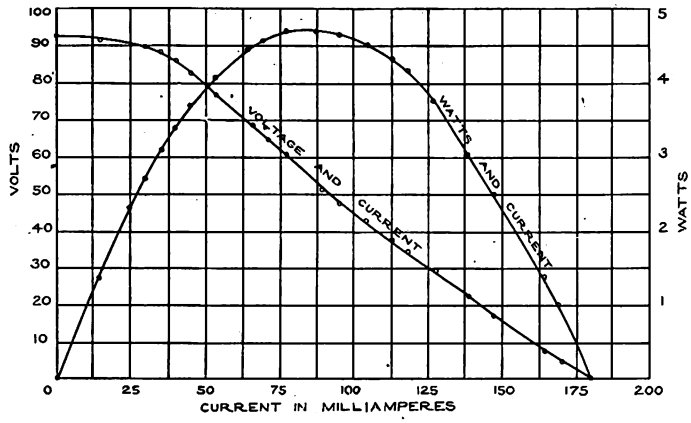

Figure 9.

TABLE OF VALUES OF CURRENT AND VOLTAGE FROM FIGURE 10.

	V	I	rI	V+rI	Lωl	L	
1.....	91.5	.0137	3.32	94.8	....	....	
2.....	89.5	.0300	7.2	96.7	....	....	
3.....	88.3	.0358	8.6	96.9	....	....	
4.....	85.8	.0406	9.7	95.5	....	....	
5.....	82.	.0455	10.9	90.9	20:5	4.65	
6.....	76.5	.0535	12.8	89.3	26.7	5.18	
7.....	68.8	.0660	15.8	84.6	38.5	6.05	
8.....	65.	.0715	17.2	82.2	44.0	6.40	
9.....	60.	.078	18.7	78.7	49.5	6.59	
10.....	51.	.0895	21.5	72.5	58.3	6.75	Mean of 6 middle values, 6.08
11.....	47.5	.096	23.	70.5	60.5	6.55	
12.....	42.3	.105	25.2	67.5	64.0	6.32	
13.....	37.6	.113	27.2	64.8	66.8	6.15	
14.....	34.4	.119	28.6	63.	68.3	5.95	
15.....	29.2	.128	30.8	60.	71.0	5.75	
16.....	22.	.139	33.4	55.4	74.5	5.57	
17.....	16.9	.148	35.6	52.5	76.6	5.38	
18.....	7.2	.165	39.6	46.6	80.5	5.05	
19.....	4.5	.171	40.2	44.7	81.5	4.95	
20.....							

Open circuit voltage 92.7 $\quad \frac{92.7}{6.035} = 15.35$ rw per sec

Volts per rw 6.035

r=240. $\quad \omega = 15.35 \times 2\pi = 96.4$

The Omaha Independent Exchange.

Omaha has been one of the bright spots where an Independent telephone plant has grown continuously since a franchise was granted to the promoters. The accompanying illustration is a poor picture of the magnificent new home of the hustling company. We hope to tell the whole story of the enterprise in a subsequent issue and at an early date, for competition at the Gate City of the West is at white heat with no prospect of abatement. The Nebraska Telephone Company (Bell) has mailed a circular to all its subscribers which purports to offer a reduced rate effective January 1, 1908.

Home of the Independent Telephone Company, Omaha, Neb.

The scheme divides the system into zones of which five have been designated. The "general zone" includes the entire service which extends to South Omaha, Florence and Benson. Zone No. 2 cuts out South Omaha; Zone 3 is limited to South Omaha; Zone 4 is limited to Florence and Zone 5 to Benson. Subscribers in Zones 3, 4 and 5 will be required to pay a 5 cent toll to any other zone. Subscribers in Zone 2 will pay toll to South Omaha.

The scheme is a practical enforcement of the message rate, but the plan will mean a direct saving to the Omaha subscriber who cares to continue the service of the monopoly. The Independent Telephone Company has started to supply service.

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History of the Automatic Telephone

By Arthur Bessey Smith

THE essentials of A. B. Strowger's first automatic switch are shown in Figure 8. The terminals of all the lines in the exchange were brought to rows on the inside of the cylinder, *A*. There were planned to be ten rows of 100 terminals each, giving a total capacity of 1,000 lines. *aa* represents the terminals and *B* the lines. In the axis of the cylinder a shaft *D* was arranged, capable of both vertical and rotary motion. This shaft carried an arm, *C'*, which was the wiper to make contact with the line terminals. In the first machine made the cylinder was wood and the terminals were brass escutcheon pins. The vertical motion was secured by the step by step action of a magnet, *KV*, which had a pawl on the end of its lever. Another pawl was provided to hold the shaft during the return stroke of the magnet.

There were two rotary magnets. One of them, *KR1*, was capable of rotating the wiper past ten terminals at a step. The other, *KR2*, could rotate the wiper only one terminal per step. In this way the vertical motion selected the hundred, the rotary motion of ten notches at a jump selected the ten, and the last rotary motion of single notches selected the unit. Mounted on or near each magnet lever was another magnet adapted to release the mechanism by pulling the pawl out of the tooth in which it was resting.

Figure 9 gives a general view of the machine and its circuits. At the left is the subscriber's instrument, with the battery for operating the magnets of the switch.

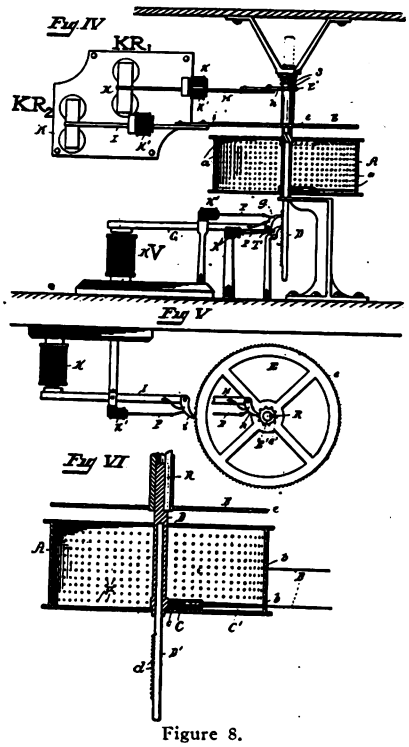

Figure 8.

Four push buttons were on the telephone box, each button controlling a wire, while the fifth wire was for talking. Each of the four wires had but one function, in striking contrast with previous systems which we have examined. Thus the vertical wire ran from the button on the telephone marked *G'* to the vertical magnet on the switch. The two rotary wires, *R1* and *R2*, run from buttons *H'* and *I'* to their respective magnets, *KR1* and *KR2*. The release line, R_0, runs from button *P'* to the switch and loops in series all the release magnets. All

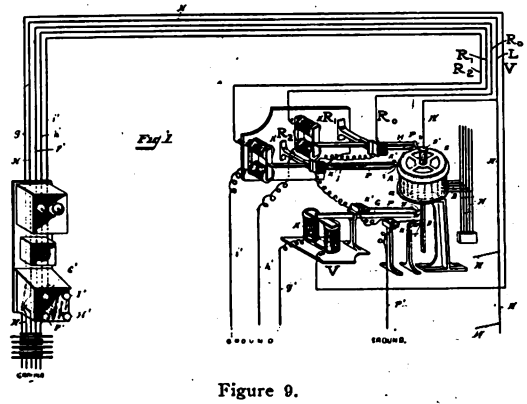

Figure 9.

these lines after passing through their magnets in the switch terminate at ground. The fifth or talking wire goes from the talking set in the telephone to the wiper in the switch, also to the proper line terminal in all the cylinders of other switches in the office.

The operation was as follows: Suppose that the number desired was 345. The subscriber would push the *G'* button three times, thereby lifting the shaft three notches and bringing the wiper opposite the third row of terminals. He would then press the *H'* button four times, which would rotate the shaft and wiper four times ten notches. Pressing the *I'* button five times would rotate the wiper five more spaces, thus arriving at 345. The ringing of the called subscriber was done with a magneto or battery. When through talking, the button *P'* was pressed, which energized all the release magnets at once, allowing gravity and a spring to return the shaft and wiper to their normal or zero position.

A number of points of interest are prominent in this machine, and I shall briefly mention them.

1. The arrangement of the contacts in rows on a curved surface. This has become almost standard. It may be regarded as very fundamental.

2. The wiper rubbing over the contacts in succession.

3. Vertical and rotary motion. For many years this has been regarded as the ideal action, but some are coming to regard a simple rotary motion as better. In the attempt to get away from the mechanical complications of the vertical and rotary motions, some very complicated electrical circuits have been evolved. But it is to be hoped that these circuits may be simplified.

4. Rotary motion in jumps of ten for the tens, followed by single jumps for the units. This action has no very good ground for being, and has been abandoned by all who have tried it.

5. Complete release to zero or initial position. This is the first switch in which the release was at all satisfactory. When the release button was pressed, the user had the satisfaction of knowing that all his mistakes had been wiped out.

6. Five wires and ground. This was excessive, but in the plans of the inventor he was to reduce the number. As stated before, he intended to take as many

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wires as he needed to work the switch and then reduce them by careful experiment.

7. Local battery. This was a very bad feature. It is not clear why all these magnets could not have been operated by battery in the ground wire at central as well as in the ground wire at the substation.

8. Calling subscriber controlled the release. This is still the case in some modern automatics, but is receiving attention.

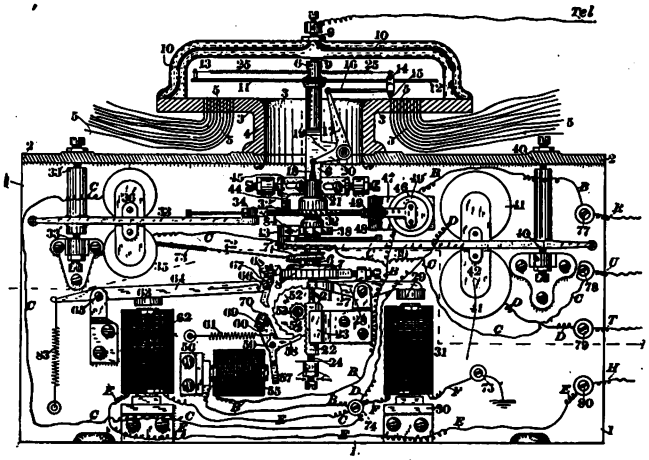

Figure 10.

9. No privacy. Any one could get in on a connection by intention, or accident. Also it will be noticed that in selecting a number, the wiper actually connected the telephone to all the lines lying in the path over which the wiper moved, though it might be but for an instant.

Some time in the year 1890 the first model was completed. It was set up and exhibited in the office of the Kansas & Missouri Telephone Company (Bell). Its operation, though in a crude state, was satisfactory enough to show its possibilities. The local manager of the Bell Company was very much interested and impressed. He mentioned to the Strowgers the possibility of selling the invention to the Bell Company, and said that he was willing to get them an audience with the company if they wished. But he advised them to develop it before trying to sell, as in its present shape they would have to take the company's terms. He said further that telephone switchboards ought to have been automatic from the start. Manual was only a makeshift and there was in his opinion no question about the future of the automatic. It was only a question of time and money to perfect it.

During this time the matter of the patent had been dragging along in the hands of a lawyer. Seemingly it was too slow in being allowed. Finally the lawyer informed the Strowgers that it had been allowed. Later they found that it was not true, and that the matter was in a very much mixed up state. When the patent authorities asked questions, the attorney attempted to answer them himself, without referring it to the inventors. Not being an electrical expert, he got things badly mixed up. When this state of affairs was discovered, the Strowgers took matters into their own hands, and dealt with the patent office directly. They succeeded in straightening out the errors and had the satisfaction of having it allowed within six months after they took it up themselves.

Joseph Harris and M. A. Meyer now urged A. B. Strowger to come to Chicago and set up his machine. Mr. Harris was connected with the World's Fair, which was at that time scheduled to be held in 1902. He told Mr. Strowger that on account of its position Chicago was a much better place to work. There were people from all parts of the country and the world and there was an excellent chance to get them interested in the invention. Both Harris and Meyer wanted to contract with the Strowgers, but offered to pay all expenses of the Chicago venture even if they failed to make the agreement.

In the fall of 1890, A. B. and W. S. Strowger agreed to come to Chicago and exhibit their invention. This they did in the early winter. The next day after arrival in Chicago the four men signed up a contract. According to the terms, each of the Strowgers was to receive a certain sum and a salary and an interest in a stock company which was to be formed later. The plan of operation was to raise money to carry on the further experiments developing the invention, and then to put the system on the market. From the date of the contract Harris and Meyer began an active canvass for the money for pushing the work.

In the meanwhile the inventors were busy setting up the model which had been completed and operated at Kansas City. Mr. Harris had an office in the Rookery building and here the exhibit was wired up. A lineman from the Chicago Telephone Company was secured to help wire. This lineman had a friend by the name of Frank Lundquist, who was visiting in the city at that time. Mr. Lundquist was also a lineman and came along to help with the work. He became greatly interested in the idea of an automatic switch.

There were many visitors to see the new wonder, and among them was the ever present newspaper reporter. There were a few paid write-ups of the usual order which attracted the attention of the people of the city. But there were occasionally humorous attacks by the papers, trying to discredit the invention by holding it up to ridicule. One of them said, "What is the use of these plebeians coming here to do what Bell, Berliner, and Edison failed to do?" Indeed, the staid electrical lights of Chicago looked on it as presumptuous in these inhabitants of wild and woolly Kansas to attempt what they were attempting. But the whiskery new-comers had been working on the problem too long not to know their ground, and were more fitted to speak on the subject than their critics.

There were many visitors from abroad, Germany,

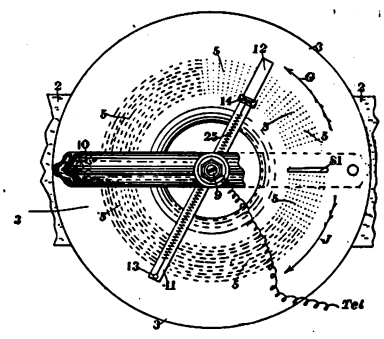

Figure 11.

France, and other European countries. The general public looked on it as a very hard problem. But these electrical men from abroad said that the idea was all right and expressed their faith in its ultimate success.

The patent which had been applied for when in Kansas City was formally issued March 10, 1901, under the number 447,918.

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Owing to imperfections in the first machine it was

thought advisable to change the form somewhat. It seemed that it was very difficult to make the cylinder, shaft, and wiper accurate enough to be sure of always hitting the proper terminal. The margin of error allowable was too small, or the actual variation of the moving parts too great, for the wiper would not act with certainty. Thinking that it would be easier to secure accuracy on a plane surface, the bank of terminals was changed to a flat disc. The line terminals were arranged in circles around the center, with the same number in each circle. It was first planned to have but one circular row of 100 terminals. The wiper was mounted on a shaft which was run through the disc at right angles to its plane. Having but one motion, the machine was very much simpler, though its capacity was only 100 lines.

Having worked out the design of the new switch, of which there is unfortunately no illustration at hand, the Western Electric Company was asked to estimate and bid on its construction. This company had been friendly to the extent of selling the experimenters anything they wanted. When the company sent over their expert to figure on the job, W. S. Strowger was left to explain what was wanted. Mr. Strowger explained the limitations, and how closely the parts must work. After listening to all of Mr. Strowger's conditions, the expert remarked:

"What do you want such fine, chronometer work for? You might as well keep the girls as to have such fine machines."

Mr. Strowger replied:

"Do you want to bid on the job?"

"Yes," was the answer.

The Western Electric Company at this time stood as a company against the automatic idea, and stood back from participation. But individually the Western Electric people were very kind and accommodating.

The job of constructing the new machines was finally let to the Union Model Works, which was run by Mr. Brown on Clark street, about half a block north of the present postoffice building. There were twenty machines made at a cost of $60 each. W. S. Strowger had gone into the matter of costs and made the prediction that if made in their own factory under his supervision the cost could be reduced to $5.00 per switch. It took three years to reduce it to that point.

In accordance with the contract, the automatic company was incorporated October 30, 1891, under the name "Strowger Automatic Telephone Exchange." The incorporators were as follows: M. A. Meyer, president;

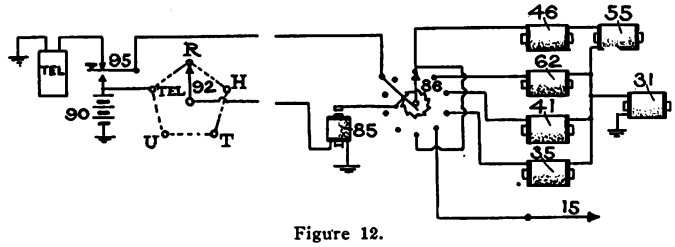

Figure 12.

A. B. Strowger, vice-president; Joseph Harris, secretary; W. S. Strowger.

The capacity of the flat disc switch was now increased by giving it ten circular rows of 100 terminals each. The principles involved are clearly shown in the patent which was afterward applied for (February 19, 1892). A general idea may be obtained from Figures 10 and 11, the former being a vertical section and the latter the plan. In Figure 10, *3* is the table or rubber disc upon which the line terminals, *5*, are mounted. The vertical shaft carries a radial arm, *12*, on which slides the wiper proper, *15*. By a very ingenious mechanical arrangement the magnet, *62*, can move this wiper out along the arm from row to row, thus enabling it to select

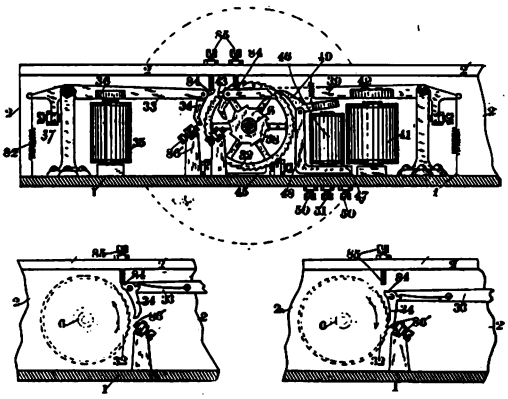

Figure 13.

any hundred. The rotary motion is given by two magnets, as in the first machine. Magnet *41* rotates the wiper by jumps of ten, while magnet *35* makes single steps. In this way the hundreds are selected by magnet *62*, tens by magnet *41*, and units by magnet *35*. The release is accomplished by two magnets, *46* and *55*, which release the rotary and radial motions respectively. The principles of the release are identical with those of the first machine, namely, the pulling out of the pawls which hold the advance motion, allowing the springs to pull the moving parts back to their zero position.

To avoid the friction which had been found to be quite a source of trouble heretofore, a peculiar mechanical action was employed in making the wiper shaft jump up and down for each movement, radial or rotary, which the wiper made. This was secured by putting another magnet at the bottom of the shaft with its armature arranged to lift it. The winding of this magnet was cut in series with all the working magnets, so that with the working of any of them the "jumping" magnet would work.

Figure 12 shows the plan of circuits from one telephone. At the left, *Tel* is the telephone, which may be of any variety. *95* is a strap key which is used to make the magnets work. A dial switch was devised to work in connection with a magnetically operated switch at central for controlling the impulses which were sent in over the upper line wire.

This dial switch has five contacts, marked *R*, *H*, *T*, *U*, and *Tel*. All the points are tied together to battery, *90*. The lever of the switch, *92*, was attached to the lower line wire and at central went to ground through the magnet, *85*. This magnet was capable of acting with a ratchet on another switch whose wiper, *86*, was adapted to move into contact with any one of ten terminals. The upper one of these terminals was wired to the two release magnets, *46* and *55* and to ground through the "jumping magnet," *31*.

The second point on the switch, *86*, ran to the magnet, *62*, which made the radial movement of the wiper. The third point connected to the magnet, *41*, which rotated the wiper by jumps of ten, while the fourth point went to the magnet, *35*, which made the single steps. The fifth point ran to the wiper itself, *15*, and was for talking purposes; it constituted the cord circuit or rather the connecting plug.

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In this way the switch, *86*, acted as a distributer for the impulses, directing them to the proper magnet at the right time. Suppose it were desired to call 234. The switch at the substation, *92*, would be turned to the point marked *H*. This sent one impulse over the low line wire, advancing the switch, *86*, one notch, bringing

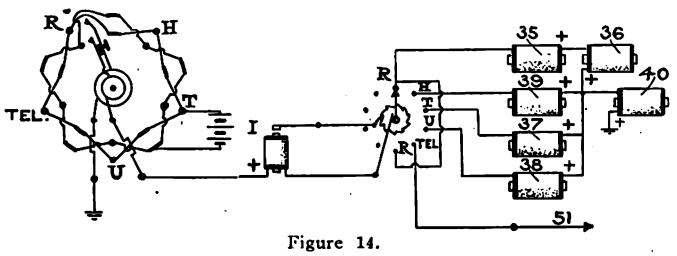

Figure 14.

the upper line wire into connection with the hundreds magnet, *62*. Then the key, *95*, would be pressed twice, energizing both *62* and *31*, making two jumps upward and outward with the wiper, *15*. Then the switch, *92*, would be turned to the point marked *T*, which shifted the connection of the upper line wire from the radial magnet to the tens magnet, that is, *41*. Key *95* would now be pressed three times to move the wiper in a rotary direction three times ten notches. In this way the units were also selected, finally switching the upper line wire onto the wiper itself for ringing up the called station and talking. There were ten terminals on the switch *86*, with opposite ones tied together. In this way the switch had to move through only a half circle in making one call and releasing.

One of the mechanical devices to which I would like to call attention is shown in Figure 13. In the upper half of the figure is shown the exact manner in which the tens and units magnets were arranged, together with the release magnet for the rotary. At the lower left hand is shown a special ratchet construction which was designed to prevent the inertia of the moving parts from carrying them farther than intended. As the movements of an electromagnet are very quick, there was danger of giving the shaft a sudden kick, and the momentum carrying it past the point. This was obviated by providing a set screw, *86*, which held the pawl firmly against the wheel, *32*, as long as the magnet was energized. This gave a locking action to the ratchet which was very effective. The sketch in the lower right hand corner shows the ratchet pulled up in locking position. Another neat point of ratchet construction was the set screw, *85*, which prevented the pawl from touching the wheel when the pawl was in its normal position. The spring, *33*, tended to keep the pawl against the wheel, but when the magnet lever moved back, the back end of the pawl hit the set screw and moved the point out of contact with the wheel. The advantage of this is most apparent in connection with the release making it unnecessary to have any release magnet to pull this pawl away.

We may now review the salient features of the system as follows:

1. The flat disc construction.
2. The lifting action to avoid friction at the contacts. This seems to have been the great bugaboo of all the early inventors.
3. The reduction to two line wires. One of these, the upper in Figure 12, was the impulse or step-by-step wire, and may be roughly likened to the vertical wire of recent systems. The other, the lower line wire in the same figure, was the controlling or directing wire, determining what magnets the other wire should act upon. It may be likened to the rotary wire in modern practice. But it must not be forgotten that the upper wire was also the talking wire, with ground return.
4. The special switch at central for distributing the impulses of the upper line wire. This may in many respects be called the "side switch," as it acts like the side switch of modern connectors. The magnet which operated it might be called the "private magnet," though it has no protective action in this case. There is one fault which we must find with the "side switch" in that its correct action, indeed the correct operation of the entire machine depended on the "side switch" keeping in perfect step with the dial switch, *92*, at the substation. If by any means they got even one notch out of step, it would result in dire confusion to the subscriber. And the latter had no means of correcting it.
5. There was no privacy provided. Any person could get connection with any other line, no matter if it were already connected with another.
6. The locking device on the ratchets. This is a very good point, and is still used on some of the best machines.
7. The aim seemed still to be to get the maximum number of stations connected at any time, by providing each with a switch. The percentage idea had not yet been applied.

This patent was issued November 29, 1892, with the number 486,909.

The effort to reduce the number of line wires led the Strowgers to attempt to use polarized magnets in connection with the flat disc machine which has just been described. On the same day, February 19, 1892, they applied for a patent on their single wire system, which was later granted and issued as No. 492,850. Without repeating the details of the former machine, Figure 14 shows the way in which the selecting was accomplished over one wire. All the magnets were made polarized, so that each required current to enter at the terminal marked "+" to work it. Current in the opposite direction would have no effect on it. These magnets are as follows:

I=magnet of side switch,
35=rotary release magnet,
36=radial release magnet,
39=hundreds magnet,
37=tens magnet,
38=units magnet,
40="jumping magnet."

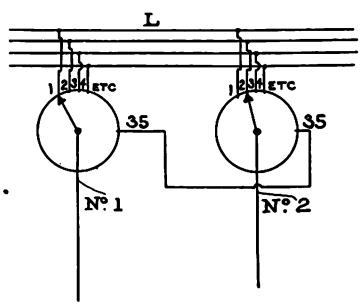

Figure 15.

The magnet, *I*, of the side switch was the only one which worked on current coming in over the line, all the others requiring current to flow up from the ground.

At the substation the dial was arranged in the form of two concentric rows of contacts. Those marked with

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a round symbol are short enough not to be touched by the two wipers, 5, unless they are pressed intentionally against the contacts. The other contacts, shown by long marks, are high enough so that in turning the wipers, 5, around they will always touch. One of the wipers is attached to ground and the other to line. The battery is attached to the two rows of contacts, all the short pins having negative battery on the outside, while the long pins have positive on the outside.

Normally the lever, 5, of the dial was intended to be kept between the two pins marked *R* and the long pins at the top. To call 234, merely move the arm, 5, over to *H* and press it two times into contact with the short pins. Then move it to the *T* pins and tap three times, then to the *U* point, and tap four times, finally to the *Tel* point and press once. To release, turn to the pins marked *R* and press once.

The operation of pressing the lever, 5, down on the short contact pins had the effect of sending impulses of negative current over the line, which operated whichever magnet was at that time in connection with the line through the side switch. But it had no effect on the magnet of the side switch. When the lever was moved from one short pin to the next, the wipers were automatically made to touch the long pins, thereby sending an impulse of positive current over the line, which operated the magnet of the side switch and shifted the circuit to the next magnet.

It is unnecessary to comment on the undesirability of bringing back the use of polarized magnets. As far as known this board was never used.

Early in the year 1892 the Brush Electric Company of Baltimore sent Mr. A. E. Keith to investigate the merits of the Strowger automatic telephone system. After a thorough study of it, Mr. Keith was so favorably impressed with its possibilities that he entered the employ of the Strowger Automatic Telephone Exchange soon after. Being a practical man, expert in factory work, his coming was a valuable addition to the forces engaged in so great a task.

The fact that the automatic system as thus far developed was not private was a great hindrance to the prospective investor and to the public in general. The financial promoters met the objection by the statement that the system had been made secret, and then called on the inventors to make it good. This Mr. W. S. Strowger did in a way which satisfied the need of the moment. Figure 15 shows the principle. *L* are the wires which connect the line terminals of all the switches together. He made the wiper of line No. 1 to rest normally on a "home" contact, as did No. 2 and all the others. Under ordinary conditions, when No. 1 moved his wiper around to talk with No. 2 they were safe from interruption by calls which might come in by any one else trying to call No. 1. The third party would find the home point of No. 1 open. But if he called No. 2, who is the called party in the connection, the third person could get in on the line. To make it entirely private, Mr. Strowger provided between each two subscriber's switches a private line, terminating on the same number on each switch, as for instance, No. 35. Then if the two men wished to converse without interruption, they would agree to shift their switches simultaneously to No. 35. As this line appeared on their two switches only, no one else could connect with them. That this was wasteful of space in the terminal bank is apparent, but it met the need for the time being.

About this time a company was organized in Canada for the purpose of pushing the automatic telephone in that territory. But there is no record of their having done anything.

The twenty machines which had been made by the Union Model Works were now put into service as exhibits in various cities. At all the places where it was shown, and all over the country, it roused great interest. As usual, people took sides, some declaring it a foolish and impossible scheme, others seeing its possibilities and wanting to buy it up. One of the practical results of these exhibits was the discovery that when the common public used the apparatus, they got electric shocks at times. Inquiry showed that these shocks came through the exposed binding posts on the receivers, which were of the ordinary Bell type which was then the standard. This led to the adoption of a type of receiver which had the binding posts concealed in the inside of the shell.

In the fall of 1892 W. S. Strowger went west to California to exhibit the system and raise money for its development. He exhibited in both San Francisco and Los Angeles. At the latter place, he was approached by a man who offered to buy out the whole invention. He proposed to get up a syndicate and trade Los Angeles real estate at full value for the automatic stock at quarter value. Mr. Strowger refused to deal with the man. He was afraid that if the automatic got into the wrong hands, the whole thing might fail. Since that time the real estate which was offered for trade has advanced till it is now worth several millions of dollars.

The spring of 1893 Mr. Strowger returned to Chicago.

West Virginia Convention.

Pursuant to a call issued by the executive committee, the annual meeting of the Virginia Independent Telephone Association was held at Norfolk, November 26th, 1907. The meeting was marked by the utmost enthusiasm and good feeling among the members in attendance.

After the opening address by the president, reports were received from various districts of the state which showed that Independent telephony has progressed along aggressive, yet conservative lines, the number of Independent companies in the state having largely increased within the present year, and a general improvement being marked in the character of service and methods of construction, it being one of the main purposes of the association to promote the extension of toll lines and uniformity in construction.

The election of officers for the ensuing year resulted as follows: President, W. N. McAnge, Suffolk; first vice-president, F. F. Marbury, Alexandria; second vice-president, Jonathan Woodhouse, Norfolk; secretary and treasurer, B. L. Fisher, Rocky Mount. Executive committee: W. N. McAnge, Jonathan Woodhouse, C. F. Bonney, George B. Keezel and F. W. Davies. Delegates to the International Independent Telephone Association, Albert Parlett and C. F. Bonney.

Upon motion, a resolution was unanimously adopted which endorsed Paul Latzke's paper, but without prejudice to any other Independent telephone publication.

Upon motion, a rising vote of thanks was tendered the retiring president, Mr. Albert Parlett, for his untiring labor on behalf of the association during his two terms of office, and for his kind and impartial manner in presiding over the deliberations of the association and its executive committee. A vote of thanks was also tendered the secretary and treasurer, Mr. B. L. Fisher, for his active and efficient work in the interest of the association.

Atrocious Floating Debts

By J. C. Kelsey

I CONFESS that I am an optimist in telephone affairs and as much as I harp to the contrary, I thoroughly believe that conditions are growing better every day, viewed in the broadest sense.

My chief motive in life is to lend assistance, even in a weak way, to protect and enhance the commercial prosperity of Independent telephony. I try to be a consistent enthusiasm booster. Enthusiasm and an *esprit de corps* are commendable in the development of any organized effort, but when these qualities are present in too great proportion they are apt to blind the perception and overthrow reason.

Flaws exist in the structure of telephone growth, they existed in the beginning, exist today and we may never get rid of them entirely. The mere fact that some things are being brought to light now that were not known till recently must not be taken to indicate an evil that cannot be overcome. The system is too good as a whole to tumble in a moment. There is no occasion for hysteria.

The trouble lies in the mistake we are prone to make in judging a man's financial condition as well as that of his company, by the rule of gross earning power, rather than the honest, net earning power.

When you see a place in bad order, you may be reasonably sure of the occupant. He is shiftless and improvident. He either owes everybody, or can't owe anybody, because no one will give him credit.

The richly furred and begoggled occupant of the six-cylinder, sixty horse power automobile passing by, impresses you differently. You would be glad to get his custom and extend him unlimited credit.

You conclude that this man receives a large income, but you rarely think that his expenses may exceed the income. He is quite frequently a negative, financial quantity, worse off than the man who owes, or can't owe. He drives his fancy automobile; belongs to several aristocratic clubs; his wife winters in Florida and summers in Europe; his son goes to Yale and his daughter attends Vassar. He has abnormal "overhead" expenses, yet we consider him a successful man, forgetting for the moment that if we add $15,000 plus to $20,000 minus, we will get $5,000 minus.

But we frown upon the poor man. We won't sell him anything unless he produces the coin. Let the apparently rich man step up to our counter, and the proprietor rushes to meet him, and will give him goods without question.

We ignore the plain, honest individual who pays as he goes. I once knew a prominent man in Duluth, who had for years bought every day at least a dollar's worth of meat from a butcher, and always reached down in his pocket and paid for it. One fatal day, he reached down in his pocket and there was no money for the meat. Did this butcher smilingly tell him to take it along? No. He told him to drop the meat. Of course, this butcher was a fool.

Had the ostensibly rich man called this same blockheaded butcher to the front door and ordered meat, he would have received it, even though the slate already groaned under a heavy debt.

The debt system must have been released by Pandora. It is one of the most sinister specters of the human race, and its records reek with countless victims, hurried to asylums and graves because of its worries. The very name sounds horrible. When you and I owe the store, it is called a plain debt. But when an incorporation owes everybody, we give it the polite name of a floating debt.

Compare the telephone companies to the individuals. If you enter an exchange office door, and find the hallway dirty and unswept, you will find upon going farther, a lazy stenographer with a couple of clerks jollying her. You will stand at the office window for a few moments, until finally your indignation gets unchoked, and you utter a warning sound to the office force. They will then let you pay your bill.

If you would examine this company thoroughly, you would find trouble men hanging around, like poor men's dogs. You will also find wretched telephone service and a floating debt.

If you go into an exchange and find it immaculate you will get prompt, courteous service at the office window. You will find efficient telephone service, too, and if you look into the company's affairs, you would find everyone busy. You will learn that the bills are discounted and there will be no floating debt.

Still another example is the exchange office where the manager's automobile stands out in front. The executive apartments are magnificent. When you ask for a payment of your account at this place you will be rebuffed for your nerve. You have bumped into a four-flushing organization. All the material is bought with long time notes. No directors can be found who are willing to add their name to the paper. This is the spot to find a big floating debt and you hardly need to look to find the company overbonded. Gross receipts will not exceed from $18.00 to $20.00 per station. This concern will claim to be operating for $8 or $9 per station, but not one cent will be found to take care of the renewal requirements. Investigation will doubtless disclose two or three of the larger exchanges in a tumble down condition and they are to be rebuilt by issuing three-year notes secured by bonds at 65.

Birds of a feather flock together. Floating debt, lack of depreciation provision, low rates, and ignorant, vicious management seem to be intimately associated.

Let us take this condition. A company owing the banks $185,000 and ordinary creditors $75,000 proposes to issue a certain amount of three-year notes, secured by bonds at 65, to secure money for four things.

First, to pay off the debt to the bankers. Oh! how respectful we are when owing a bank money. Why? Because when a bank loans money, it has sense enough to have good, reliable names on the notes. Banks don't loan money to the company. It really loans to individuals interested in the company. Queer how potent the mere signature of a man! Does the manufacturer always have good signatures on his notes? Not always. He is not a privileged institution like the bank! The bank loans real money, while the manufacturer merely loans the equivalent of money and in many cases without any security.

Second, to pay off $75,000 worth of small debts, scattered among a dozen exchanges. What a monument to a manager's sagacity to buy all kinds of apparatus! Already a bunch of mutual telephone company owners know better than to mix apparatus, if only for the sake of the good name of maintenance.

Third, to have money in the treasury for the purpose of discounting bills. Truly a laudable purpose.

Fourth, to rebuild a certain worn out plant at a cost

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of $100,000. Pray tell me who has a right to be called conservative and sane, and wants to hold his job, who will publicly announce that a plant will be rebuilt out of the capital account. Oh, where is the renewal reserve for this purpose? Echo answers that it has been paid out in dividends. Criminal management does this. The future is ignored and discounted, and the widows and orphans will mourn.

Now the question—the first debt of $185,000. Is this chargeable to capital account, and can it be paid for this? Is it absolutely true that this $185,000 has been borrowed for construction purposes alone? Will someone take oath that thousands of this great amount have not been used for reconstruction or improvements? These items are mere expense, and should be paid for by earnings.

What is the second account of $75,000? This is for equipment. Will these people swear that this $75,000 is for absolutely new purposes, and did not replace worn out equipment?

The third account of cash on hand will do some good, providing it is not needed to go on with the same program of paying bond interest and dividends.

The fourth account admits of no question. It is a pure item of expense and is nothing but replacing a worn-out plant. Here is a plain case of neglect of depreciation and a proof that dividends and bond interest have not been earned.

A property that cannot earn $3 per station cash renewal reserve per year and which pays barely its bond interest only, is guilty of paying interest out of the principal.

A default in interest should mean a receivership. But one can pay interest with his receipts and let the honest bills go.

Telephone interests, pay as you go! If you cannot pay your bills, stop your dividends.

If the payment of your bills will ruin you, it is plain that their non-payment will ruin the creditor.

A company is no different than the individual. Both should pay as they go. You know as time goes on and your company expands, the more it costs to operate. The future holds no joy for you.

Make some preparation to get right. Pay your debts. Meet the coming years with an easy heart. Independent telephony started on the crest of the prosperity wave. It has never faced depression.

The temptation is great to add to debt. Scarcity of money makes you willing to trust to the liberality of the manufacturer and supply dealer. But they can't stand depression as well as you can. Show me the average manufacturer, whom you deem is growing rich, and I will show you that he owes the banks more than you suspect. The notes you give to him are simply carried on to the bank and the additional name is all that puts off the fatal day.

Let us all have more self-respect. Accordingly, let us hate debt. Let us pay it off, even if personal interests have to suffer. It is better to break only an arm than it is to break a neck.

This, then, is my admonition—pay your debts. Don't call yourself prosperous when your statement shows any debt whatever. Your books may show a surplus of $40,000 and a debt to the bank of $20,000. Don't fool yourself that you are $20,000 ahead because you are $20,000 behind, and you know it.

Figures lie like Ananias. You cannot fool yourself without paying a foolish penalty. You cannot show an honest surplus when you owe the bank $20,000, for instance. Your books may show a surplus, but it is a doubtful one, unless you have charged off large property items every year. It is not human nature to do this.

Pay your debts. It is even more important than your proposed new switchboard and your new toll line. It will make the manufacturer happy and enable him to spend more money in perfecting his machinery to give you better apparatus. It will help the supply dealer who will sell you goods cheaper, because of the removed load of carrying accounts. You will feel freer and happier, and your whole force will feel the influence of a newer power within the company. You will set a good example to your employes and to your subscribers. And the future generation will rise up and call you blessed.

Protection of Telephone Apparatus

By P. Kerr Higgins.

THEORETICALLY the best protection against high tension currents is to avoid them, but this is not always practical, so we must devise some method for protecting property. Injury to telephone companies from electrical causes may be covered under the following heads: Lightning discharge; crosses with high tension currents; and those damages due to sneak currents. It is not my intention to theorize any more than absolutely necessary, but some knowledge of the factors involved is necessary in order to understand how to best protect against this destructive force.

The experiment of Franklin in 1752 marked the beginning of the study and served to draw attention to the theory that lightning might be protected by suitable arrangements, hence the introduction of the lightning rod. In telephony, we handle currents working almost invariably under very low pressure, the highest being that used for signaling purposes and even then it is not high enough to cause damage. These lines are nearly always exposed to damage from lightning and are frequently liable to damage from high tension crosses, or sneak currents. It is unnecessary to elaborate very much upon the trouble due to high tension crosses for the reason that this and the trouble due to sneak currents are much better understood by the average telephone man than the somewhat complicated forces which nature arrays in the form of lightning, hence it would appear advisable to consider the subject of lightning somewhat before drawing any conclusions as to the best form of protection.

The laws governing lightning discharges are usually very complicated and difficult to understand for the reason that there are different kinds of discharges and even then these discharges vary considerably in character. Dr. Franklin proved that lightning and electricity were alike, yet I wish to show that the prevailing idea that the conductivity of the conductor between the lightning rod and the ground must be of the very highest, requiring the use of copper, has been proven by experience to be a wrong theory. We have been taught that lightning is an alternating current of very high frequency, probably millions of times greater than any-

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thing we have been accustomed to meet with in practice, yet latest researches indicate that lightning may be manifested either as an alternating current of high frequency having very high capacity and slight induction, or as an alternating current of low frequency with less pronounced static effects and being more inductive in its character. The amount of current actually present in the lightning discharge varies considerably, ranging from a fraction of an ampere to thousands of amperes. It would appear that the electrification of the moist particles of air are due to friction and the resulting stress caused by this condition is probably the reason for the discharge, being due to the enormous difference of potential between the clouds and the earth. We know that air under low electrical pressure, such as is familiar to all of us, is considered a splendid insulator, but we also know from experience that even air will break down at very high pressure.

In order to demonstrate the peculiarities of lightning, we may take the two open terminals of an electric machine or battery and observe that they are in a charged condition. The current at the opposite poles has a tendency to reunite through the air and the distance at which this is possible will depend upon the pressure or difference of potential at the terminals. The area of the exposed surface and the proximity of the poles has some bearing. We also know by experience that current has a tendency to spread itself over the surface of the conductor and also to leave it which is due to internal repulsion. This action is frequently seen on high tension insulators and is known as leakage. This leakage is increased at the ends of conductors and is called a "brush discharge," because of its peculiar brush appearance. As the pressure increases, so does the discharge, unless the conductors are placed further apart. If this is not done, the air breaks down under the strain and the circuit is instantly closed with an explosive effect and will probably destroy any metal in its path. This explosive phenomenon is called "spark discharge," and the peculiar freakishness is typical of lightning. The discharges may be between any oppositely electrified bodies.

In winter a large amount of trouble is due to static charges, which results in the burning out of drops, sparking on relays and in many cases fusing the points together. This disturbance also makes the toll lines very noisy even when no damage to the apparatus is noticeable. The difficulty may be obviated by bridging a differential relay across the line and grounding the neutral point. Many telephone companies are now connecting up drops in this manner.

Paths properly designed to care for lightning discharges have a tendency to draw the static charge in that direction and carry it off safely to ground. For example, a pole line may be struck and if there is an open space cut out anywhere on that line the static discharge will have a tendency to go to it, which may be at either the sub-station, the terminal pole, or the central office. It is therefore extremely dangerous to allow a long exposed line to be connected to a lead cable without suitable air space protection. The reason is that the cable itself is virtually an open space lightning protector, and the lightning having a tendency to discharge itself across the dielectric, such as air or paper, the lightning will refuse to go past bends, turns, or coils in the cable and hence discharges itself through the paper insulation to the adjacent wires or the lead sheath as the case may be. It is apparent, therefore, that the open space cut out should be provided at the junction of the open wire with the cable and in addition to this, every cable should be bonded to the messenger or a first-class ground at intervals of not less than 500 feet. In attempting to locate trouble caused by lightning where the cable has been properly bonded, it will be found nearest the point indicated by the Varley and Murray loop test or at the first bend in the cable. All open wire leads in the country should have every tenth pole provided with an iron wire running its full length and about six inches exposed at the top, ending in a small coil of the same wire at the base of the pole, or five feet in the ground, in order to take care of static discharges which may take place along the route.

Lightning will refuse to go through impedance or retardation in every case, hence if there are loops in the cable it is invariably found that the sheath breaks at such points. In providing protection against lightning it is well to give as much area in the carbon plates as possible, because the area is largely responsible for the effectiveness of the arrester. It is considered good practice in protecting lead cables against aerial wire of considerable length, to install copper blocks instead of carbon blocks. A study of lightning phenomena will prove that this is a useless waste of money because a non-arcing metal of cheap grade will serve the purpose equally as well. Iron will serve the purpose, but in case of a heavy discharge is very rapidly fused. But the blocks should not be too large, or they will raise the protential to that of the earth and thus unbalance the circuit which they are protecting. The best blocks for use where carbon blocks are not considered advisable is an alloy of zinc and antimony. These will resist a tendency to arc when an alternating current passes through them. Carbon plates are not used at the outer end of cable points because the dust released during the discharge is liable to be very annoying and increase the annual maintenance charges.

Proper protection for telephone equipment is considered by most companies as of secondary importance. It is practically an admitted fact that protection is necessary. Not only is it necessary to protect the apparatus but it is a duty to protect both the operator and the patron. A charged line is not only a menace to the safety of the exchange, but a positive danger to any one likely to come in contact with such a line at any point. I am of the opinion that it should be considered a criminal offense not to properly protect telephone lines.

We may be somewhat behind in our methods of protection. For example, we have a condition shown in Figure 1, in which the circuit consists essentially

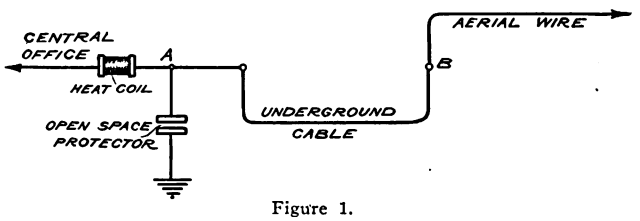

Figure 1.

of four parts: the exchange, the underground and aerial cable, the line and the instrument. It has been common practice to protect the exchange apparatus at *A* by means of a high tension current arrester; to protect the cable with a one, three or five ampere fuse at *B*, and sometimes protection is provided at the instrument. Some companies install a piece of fuse wire (3 amp.), some a tubular enclosed fuse, and some a combination protector, being a duplicate of the exchange protection in compact form. The latter is the exception, owing primarily to the expense and the liability for trouble in

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such an arrester. All this is good, but is the practice correct?

Suppose a cross takes place between some foreign wire and a telephone line protected as described. The probability is that the current will pass the 3-amp. fuse and enter the cable. Suppose the amperage is low and the voltage high, the foreign current enters the cable and breaks down the insulation at the nearest weak point. It cannot reach the air space protector at the exchange end without passing through the cable, which means resistance, retardation, etc. Lightning and other high tension currents will break down the insulation, nearly always at the first bend in the cable, aerial or underground, according to conditions, and form an arc between wire and wire or wire and sheath to ground. It does this to reach ground without encountering retardation. The proper place, then, for the arrester or protector on long exposed lines is at the end of the cable (Figure 2), because in this way you not only protect the exchange apparatus, but also the cable, which is equally important. Our protectors are too complicated and too cumbersome. What is desired is a small protector so arranged as to be available for installation at cable heads and at instruments. The number of protectors in common use are legion and are divided into three classes: (1) sneak current; (2) high tension; (3) combination. In each of these divisions are many obsolete patterns and while they may be interesting from a historical standpoint, yet it is scarcely necessary to consider them, inasmuch as the fundamental principles underlying them are alike. Perhaps the best known, fuse is the Maxstadt, shown

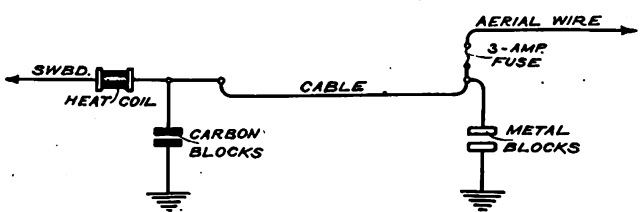

Figure 2.

in Figure 3. This device has stood the test of years and while the very best for local circuits their use for outside protection has practically been abandoned. For local circuits not exposed to foreign crosses there is no better protector, both for cheapness and reliability. Its very simplicity makes it desirable. Its place for sneak currents has been taken by the Thermal protector, popularly known as the "heat coil," deriving its name from the heating operation which is its strong feature. Such a coil placed on a line protects it in the following manner: The foreign current (greater than those used on telephone circuits), coming in over a line thus protected, encounters resistance in the coil and produces heat therein. This generated heat is concentrated on a given point by being covered with a hard-rubber shell. The point on which the heat is usually concentrated is the junction of the ends to the core, the two ends being fastened together by means of a low melting solder.

Following is the recipe for such solder, and while there are many others, this is extremely reliable: 1 part block tin; 1 part cadmium; 2 parts lead; 4 parts bismuth.

Around the copper tube is wound fine, silk-insulated German silver wire to a resistance of about 8 ohms. This is done by doubling the wire on itself. Carefully suspend the coil on springs. The spring tips are brought together so that when the coil is in position there is a slight tension on it. The heat produced in this coil melts the solder at ½ amp., releases the parts, which are separated by the tension of the springs, and opens the line on the switchboard side, thus grounding the line side. By providing alarm with these coils a buzzer will ring when the coil is blown. The core of this heat coil may be of material capable of producing enough heat to melt the solder used for securing the parts. There are a number of forms of self-soldering heat coils in the market which are reliable, compact and simple and in conjunction with the high tension current tubular fuse protector make ideal combination.

High tension currents of more than 220 volts—including lightning discharges—will prefer breaking down

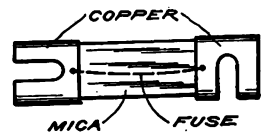

Figure 3.

dielectrics to going through retardation. This is recognized in all protectors, and the original, commonly called the "saw-tooth," was very effective with the exception that such currents usually fused the parts together. To overcome this, carbon was adopted and is in universal use. The most popular form is shown in Figure 4, which consists of two carbon plates set up with the rough surfaces face to face and a thin sheet of mica, silk or celluloid, placed between the plates. Two plates are used for each side of the metallic circuit, one on each side, connected to the line and held in place by a strong spring, the other plate on each side being held in place by a spring connected to ground. The strong current coming in on the line encounters resistance in the exchange and line or cable equipment, and rather than go through this to ground, it breaks down the dielectric at *AA* and escapes to the ground, thus protecting the apparatus. It is evident that if such protectors were located at the junction of the line and cable, not only would the exchange apparatus be protected, but also the cable wires. This should always be done where open wire over a quarter of a mile in length enters the cable.

There are several combination protectors in the market and we shall briefly consider two of the leading types. The first consists of three parts: a carbon air space; saw-tooth air space; a "Maxstadt" fuse. A knife switch is connected in this arrangement, providing a ready means of testing. This is very complete and effective and may be mounted on slate, hard rubber, porcelain or hard wood, but is too cumbersome and expensive to satisfy the demand.

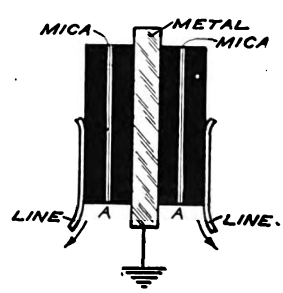

Figure 4.

Another distinct type as to efficiency consists of a porcelain or other insulated base, on which two binding posts are mounted for terminating the line ends. To each of these binding posts is connected a clip, into which is slipped a tubular line fuse of 3 amp. capacity. This is made of fuse wire, concealed in a hard wood tube, and so arranged as to be non-arcing. Attached to and in conjunction with this, is the standard heat coil

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and carbon protectors, neatly arranged and placed under a glass cover. It is usually found in practice that the line fuse seldom, if ever, operates when the heat coil does not; hence, as a general thing, the heat coil will operate under all ordinary conditions, and when it does not, the air space protector will take care of any other foreign current. A high tension current usually passes the fuse and heat coil to be caught by the air space arrester. If the sneak current is less than 3 amperes and greater than ½ amp., it will usually burn the wire of the heat coil, but do no other damage unless the heat coil is defective. No inflammable material should be placed near protected apparatus. A cheap "Maxstadt" fuse, in conjunction with a heat coil and an air space protector will therefore take care of any kind of current which may come in over the telephone line.

The ideal combination protector will protect under all conditions and will not take up much space. It should provide easy renewal when burned out. The terminal points, boxes, or "can tops," of all cables should be arranged to accommodate a combined fuse protector on each line. This necessitates slightly enlarged boxes, but we will then locate the apparatus where it ought to be and what we lose is space at the terminal points will be gained at the central office. In making such arrangements it should also be remembered to provide for the testing.

There being no absolute protection against high tension currents, it behooves operators to co-operate with traction companies so that the wires will not become crossed.

The Plaint of a "Man Who Knows."

Editor SOUND WAVES: There seems to be a great stir all the way from the International Independent Telephone Association down to the state district associations. Notices are being sent out to operators of Independent plants all over the country giving rigid instructions about the care that should be exercised in the purchase of supplies and equipment. We are admonished to confine our purchases to the Independent manufacturers. The warning would have us prevent any of our money slipping into the coffers of the Western Electric Company. The instruction is seemingly given for the exclusive protection of the manufacturers of Independent apparatus, regardless of whether the operators could purchase to advantage for himself or not.

The one main argument seems to be that the Independent manufacturers and supply men are large financial contributors to our various telephone associations, and as operators we must protect them. I am heartily in accord with every phase of the movement, and shall do all in my power to help the good work along and shall spare no time or efforts to bring about the required results, but I do believe that reciprocity is also due to the operators from the hands of the manufacturers and supply men.

Most of them are perfectly willing, and in fact have always been willing to sell to sub-license companies, even though they operate in the same territory with the Independents. All the efforts and pressure that the Independent companies have been able to bring to bear has been of no avail. With the aid and assistance the sub-license companies have received from the Independent manufacturers, a source of great annoyance has been fostered which has cost many of the Independent operators good hard earned money to overcome.

This practice should have been stopped long ago—in fact, long before the Western Electric Company decided to sell any one anything. Had this bad practice never existed, there would have been less sub-license companies in the country today to deal with. The Bell Telephone Company is not the competition that the sub-license company is, and the latter does far more to injure us in every way than the common enemy.

However, the practice I have related is not to be considered in the same mentioning with the much greater injury which is continually being perpetrated by representatives of a great many of the sympathy-reaching, so-called Independent manufacturers and supply companies. They are in the habit of invading a strictly Independent territory, where exists neither Bell nor sub-license company; visit among the merchants and farmers and agitate the building of competitive plants. The main argument is the cheaper rate. They oftentimes advocate that if the Independent long-distance lines will not give connections they can get the service through the Bell Company. These terrified trade seekers have even been known to go so far as to make drives in the country in the territory of Independent operators and discourage the subscribers by telling them that in some other locality the Independents are furnishing service at from 25 to 50 cents per month less than they are getting it for, and suggest to farmers that the building of their own lines would reduce their rentals. Since the Bell Company has made a 25c per month switching charge in certain territories it gives a great leverage for the farmers to work on and keeps the Independent operator in continual trouble trying to protect his interest. It also keeps him spending his money for this purpose when it might be used for betterment of service.

All of this trouble is brought about for the simple reason that representatives want to sell goods—regardless. It seems to me that now is the accepted time for the Independent Telephone Manufacturers' Association to send out notices to their agents and salesmen to immediately stop this practice and to get in touch with the Independent operators and try to get their advice as to territorial conditions. By so doing we will all get closer together and produce wonderful results.

W. J. STADELMAN.

German-American Technologists.

The National Association of German-American Technologists consists of eight societies located in the cities of Baltimore, Md., Brooklyn, N. Y., Chicago, Ill., Newark, N. J., New York, N. Y., Philadelphia, Pa., Pittsburg, Pa., and Washington, D. C. The membership is about 800 men representing all branches of engineering. The purpose is to keep the members acquainted with the progress of the technical arts outside of their own profession by means of papers and excursions. Sometimes meetings are called for discussions without reading of a regular paper, questions asked and answered and short talks given on technical or scientific topics. The meetings are usually well attended. Ladies are sometimes invited, but the social side does not play a large part. Usually the members remain together after the meeting and each society has its year end banquet. The association is managed by a head society, changing the office every year from city to city. For this year, Chicago is head society and its officers are also officers of the whole association. They are Mr. F. Lubberger, president; Mr. O. Eisenchinel, vice-president, and Mr. A. Heilbrunn, secretary, all of Chicago. The next annual meeting will be held at Chicago in August, 1908.

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Some Questions Answered

By Arthur Bessey Smith

Instructor of Telephone Engineering, Purdue University.

Editor SOUND WAVES: If it will not be too much trouble I would like to know the action of the common battery switchboard which has no relays on the cord. I do not see how it can be possible to operate supervisory lamps without supervisory relays. If you can give a diagram of the circuit I shall appreciate it.—T. L. C.

In Figure 1 is shown the circuit for which you have called. It is a full three wire system in both cord and jack. The line relay, *LR*, has two windings of equal resistance and turns. These are permanently attached to the line and are for the purpose of feeding signalling and talking current. The resistance of each winding can be from 100 to 250 ohms. The line is attached to the tip and ring of the jack. The line relay has but one armature spring with a front and a back contact. The armature spring goes through 15 ohms to positive battery. The front contact goes to the line lamp. The other terminal of the lamp returns through a common wire to a pilot relay, *PR*, which goes to negative battery, there being one pilot relay for all the lamps in one operator's position.

The sleeve of the jack is attached to the cut off relay, *COR*, the other terminal of which goes to the armature spring of the line relay. The cut off relay has a resistance of about 500 ohms.

The back contact of the line relay is connected to

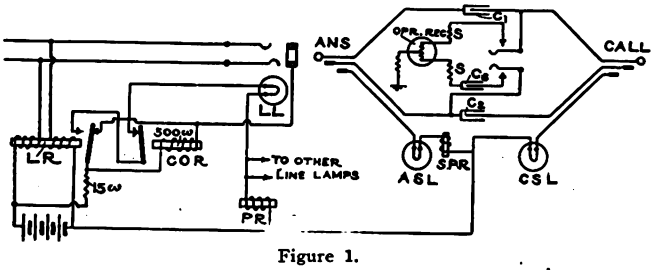

Figure 1.

the sleeve of the jack, so that in its normal position the cut off relay is short circuited. It will be noted that the line from the front contact of the line relay passes through the contact on the cut off relay on its way to the line lamp.

The cord circuit is about as simple as could be devised. The tip and ring, the talking circuit, are merely two conductors with a condenser cut in series with each. The third strand, sleeve, contains the supervisory lamps, with negative battery tapped between them. It will be noted that the answering supervisory lamp, *ASL*, has the low resistance, supervisory pilot relay, *SPR*, in series with it, while the calling supervisory lamp, *CSL*, has none.

In operation, the line relay is pulled up by the removal of the receiver at the substation as in all common battery systems. This lights up the line lamp through the 15 ohm resistance, the line relay contact, the cut off relay contact, and the line pilot relay. This pulling up of the line relay has taken the short circuit off the cut off relay. Now when the operator plugs in, current will flow through the third strand as follows: From positive battery through the 15 ohm resistance, cut off relay, sleeve of jack, sleeve of plug, answering supervisory lamp, supervisory pilot relay, back to negative battery. This will pull the cut-off relay up, breaking the line lamp circuit and thus putting it out. Owing to the high resistance, 500 ohms, of the cut off relay, the supervisory lamp will not light up, neither will the supervisory pilot relay operate.

After the conversation is completed, the subscriber hangs up, this taking the short circuit off his line. The line relay de-energizes and falls back. This short circuits the 500 ohm cut off relay so that the supervisory lamp can light. It has been found that a 24 volt lamp will light satisfactorily through 15 or 20 ohms. The supervisory pilot relay must be marginal in action so as not to pull up through the 500 ohms of the cut off relay, yet pull up reliably when the resistance is reduced to 15 ohms plus the lamp.

The busy test operates in general on the same principles as any other system. The operator's receiver is inserted between the two halves of the secondary of her induction coil. A tap from the center of the receiver is led to positive battery through a suitable resistance. Thus when the key is in the listening position there is a path from the tip of the calling plug through half of the receiver to positive battery. If the tip be touched to a line which is not busy, there will be no flow of current through the operator's receiver, for the sleeve of the jack will be at the same potential as positive battery. But if the line is in use by the insertion of a plug somewhere on the board, there will be a flow of current through the cut off relay, thus causing a difference of potential between the sleeve of jack and positive battery. This will cause a small current to flow through the operator's receiver when the tip of the calling plug touches the sleeve of the jack. In case the called subscriber has not answered, the voltage between sleeve and positive battery will be that due to the 15 ohm resistance multiplied by the current flowing through it. If the called subscriber has answered, the short will be off the cut off relay and the voltage drop will be that due to the whole 515 ohms. But the click will not be proportionately louder, for the current will be less.

No ringing key has been shown in the figure for the sake of simplicity. Its insertion in the tip and ring of the calling cord is a simple matter.

Editor SOUND WAVES: Be so kind as to answer me the following questions: I want to know the necessary size of poles for a 50 wire and six 25 pair cable pole line, fifty feet high. Our company uses square yellow pine poles and in our territory there is no snow and sleet. Will you also kindly explain a rule for calculating the stress and strength of rectangular and square yellow pine poles? We use 4x5-inch and 6x6-inch tops.—C. S.

If you space the cross arms 24 inches on centers, there will be five cross arms for the open wires and one steel arm for the cables, since the cables are small we can hang them all on one cross arm. This makes six arms. Allowing eight inches at the top of the pole, the bottom cross arm will be ten feet, eight inches from the top. As the pole top is to be fifty feet from the ground, the bottom arm will be 39 feet 4 inches from the ground. Since we have no snow or sleet to contend with, we will figure on wind alone. With spans 132 feet long, No. 10 B. & S. wire, wind at 90 miles an hour, the total wind pressure will amount to something like 4,000 lbs. Assuming this to be applied at a point 45 feet from the ground, and that the taper of the pole is such that the

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rupture will occur at the ground, we may apply the formula,

$$P = \frac{1}{6}\ \frac{Rbd^2}{l}$$

where P = pull due to wind, R = modulus of rupture, b = breadth of pole in inches, d = depth of pole in inches parallel to pull, l = length of pole in inches from ground to point of application of pull. R is given in pounds per square inch necessary to pull the wood apart. It may be taken at about 10,000 lbs. To find the size of square pole to stand this stress, solve the above equation for bd^2.

$$bd^2 = \frac{6Pl}{R}$$

or if the pole is square, $b = d$ so that

$$d^3 = \frac{6Pl}{R}$$

Inserting the above named values and allowing a factor of safety of ten, we get a pole almost 24 inches square.

If this pole is sawed out of a round log, the latter would need to be 34 inches in diameter at a point eight feet from the butt. This would be 106 inches around, and I doubt if such a large pole can be secured. You will have to use the largest and best 60-foot pole which you can secure and set it eight feet in the ground. It is no small thing for such a line to go down.

For getting the deflection which a given stress on a pole will produce, the following formula will hold:

$$\text{Deflection} = \frac{4Pl^3}{Ebd^3}$$

where E = modulus of elasticity which may be called 1,926,000 for long leaf yellow pine, l = length of pole in inches, b = breadth in inches, d = depth in inches, parallel to direction of pull. P = pull in pounds.

In calculations such as the foregoing it must be remembered that it is not usually the steady wind which brings a line down. In any wind storm the average wind velocity may be only 40 miles per hour, while single gusts may run ten or twenty miles per hour above this.

If we had used a wind velocity of 75 miles per hour, which is the same as 20 pounds per square foot of flat surface, the pole would have figured out 20.5 inches square.

Editor SOUND WAVES: Can you give me any information as to the usefulness of Pupin coils as used in telephone lines? —L. L.

Pupin coils have been used chiefly in telephone cables to counteract the effects of capacity. In overhead lines the capacity is far less than in cables and the need for correction is not as great. In fact, good copper overhead wires give about as nearly ideal transmission as can be asked. But on very long lines the capacity begins to have the same effect as in cables, causing the voice to become drummy and indistinct.

From tests made, the unloaded cable shows up better for distances not exceeding 8 or 10 miles. Beyond that, the cable loaded with Pupin coils is necessary for loud and clear articulation. Open wire lines are better unloaded up to from 200 to 500 miles, depending on the conditions. Beyond that the loaded line shows up better.

Editor SOUND WAVES: How can the vacant trunks in the Strowger automatic system be arranged so that a subscriber accidentally getting in on one of them will not be held up? Suppose we have a system of three digits. The first selector will have trunks to all the hundreds, but it is not likely that there will be ten to each. This leaves a few vacant contacts in each row. If all the trunks happen to be busy at the time I call in, my first selector will be stepped past all the live contacts and landed on a pair which is dead. The last act of my dial on the first pull is to ground the rotary line, which operates the side switch, and cuts off the vertical and rotary relays. Then my line is left stranded, with nothing to operate. The same will happen if there are some vacant hundreds, owing to the full capacity of the board not being used. Please show how this trouble can be remedied.—R. T. E.

Reference to Figure 2 will show how this result may be accomplished. This shows in the simplest form the arrangement of relays and magnets in the first selector. The details of normal operation need not be explained here, as that was given in last month's issue. It is only necessary to remind ourselves that the private magnet, PM, controls the switches, S_1, S_2, S_3, and S_4. These are a part of the "side switch" which plays such an important part in automatic switches. Having been automatically rotated to the trunk which we will suppose is vacant, the private magnet will snap into its last position, opening S_1 and S_2 and closing S_3 and S_4.

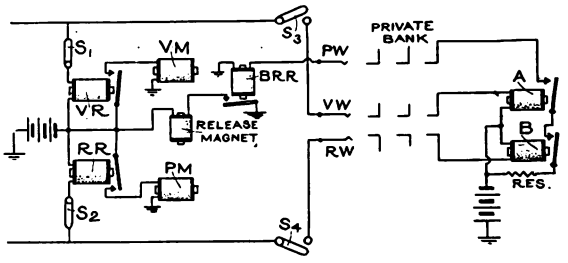

Figure 2.

This removes the two line relays from the line and continues the line to the two special relays, A and B. At the same time the release line is completed from the private wiper to the contact in the private bank which runs to the contacts of the special relays. These contacts are in series and connect with battery through resistance. If both contacts are closed at once, it will feed current through the release line to the back release relay, BRR, which operates the release magnet, $R1$. As the subscriber, not knowing the conditions, completes his call, the A relay will flutter with the impulses of the vertical, and the B relay respond to the single ground on the rotary line. When the subscriber tries to ring the A relay will pull up as the vertical line is grounded, but in no case will anything further happen. When he tires of waiting, he will hang up. This momentarily grounds *both* lines, thereby pulling up A and B at the same time. This causes the release as just explained.

Care must be taken to have the relay A very quick acting. If it is sluggish, it will lag behind the impulses just enough to be still closed when the B relay comes up.

If the exchange is small, the one set of relays can be multiplied to all the vacant trunks on all the first selectors.

Editor SOUND WAVES: On our common battery exchange there is a subscriber who persists in using his telephone to talk to his clerk at the extension on the same line. This of course confuses the operators. Will you please give a method to prevent this?—A. O. S.

There are two ways of securing this end, each of which has its own advantages. Both involve signalling over the ground. Figure 3 shows one of the methods.

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Not knowing the particular type or wiring of your switchboard, I am obliged to assume that you have an ordinary line relay controlling a line lamp, and that the jack is two wire, with the signalling apparatus cut off by inside contacts in the jack, though it might as easily be cut off by a cut-off relay. In place of the regular line relay is

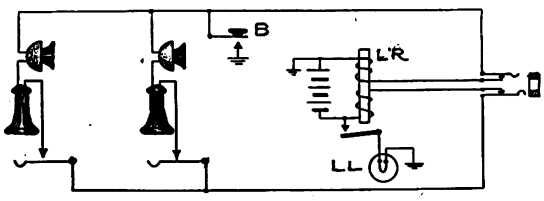

Figure 3.

used a differentially wound relay. The regular relay might be rewound with two coils of equal turns. The two coils are to be connected so that when the subscriber lifts the receiver from the hook and draws current for talking, the two windings on the line relay will oppose each other and the line lamp remain unlighted. But if he wants to call central, he presses the button *B*, which grounds the tip side of line and short circuits one winding of the relay. This allows the other winding to become operative, which lights the lamp.

The other plan is shown in Figure 4. This employs the regular line relay without change in position, but a special relay is inserted in the tip side of the line as shown. This may be another line relay like the regular one, and the lamp wire is carried through both contacts in series. If the subscriber wishes to call central, he does so in the ordinary way by taking the receiver from the hook. This energizes both relays and lights the lamp. If he desires to talk to the extension telephone, he must press the button *B*, which grounds the tip line. This short

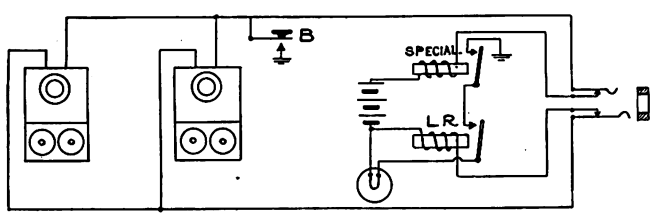

Figure 4.

circuits the special relay, causing it to fail to pull up when the receiver is removed from the hook. So the line lamp will not light and the two may talk undisturbed as long as the button is kept closed. If the line is an open wire line and in a district which has much inductive disturbance, it will tend to be noisy when the button is closed, but as the subscriber is getting an additional service, he should not complain.

The noise might be lessened by making the special relay of rather high resistance and putting a low resistance retardation coil in the ground wire of the button. The special relay may have just as high resistance as will not prevent the regular line relay from pulling up through it. The retardation coil may have as high resistance as possible, but must be low enough to prevent the special relay from pulling up when in parallel with it.

Of course, if there are differences in the potential of the ground at central and the substation, it may give you trouble. But ordinarily there is nothing to fear from that.

It will be observed that in the first plan, Figure 3, the operation of calling central is unusual, while in the second plan, Figure 4, it is the usual operation. It is always best if possible to have the unusual operations associated with the additional service, so that one unaccustomed to that particular telephone could get central the same as from any other telephone.

Editor SOUND WAVES: Please answer this question in SOUND WAVES. How do you go about fixing a common telephone generator so that it will give either alternating or direct current? I also would like for you to illustrate the wiring of a grounded party line so as to ring the bells by alternating current and the drop by direct.—H. L. T.

The operation of changing the ordinary hand generator to the pulsating kind is one which is not very easily done. Some mechanical skill is the chief requisite in addition to proper tools to make the work substantial. Figure 5 shows the most approved manner of doing the work. At the right in the Figure *A* is a disc which must be secured to the insulated terminal of the armature winding. If the rod which forms this terminal is not long enough, it should be removed and a longer one put in its place. At the left is shown the form of this disc. It is made of brass and fits the rod tightly. The shaded portion is cut away and filled by fiber insulation. The spring which

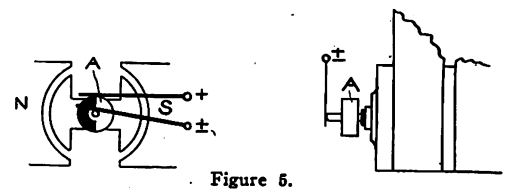

Figure 5.

is to collect the pulsating current is marked "+," and should be fastened to the frame of the generator, but insulated from it. The position of the brass disc should be adjusted as shown, so that the spring, +, will be passing from the insulation to the brass when the armature is generating no voltage. Thus during half a revolution the + spring will be receiving positive current. During the other half revolution it will be riding on the insulation and consequently receiving no current. In this way all the current will flow in the same direction. The spring which is to collect the alternating current should be arranged to bear against the terminal rod continuously, as shown at ±.

A somewhat cheaper and easier way is shown in Figure 6. In this case the brass disc is replaced by a stout wire, *B*. The spring which is to collect the pulsating current is made curved to fit the path of the end of the wire. It must be so adjusted that the spring will touch the rotating wire during half a revolution so as to catch all the current flow which comes in one direction. This will be secured as the relation is shown.

The mechanical ingenuity of the worker must be

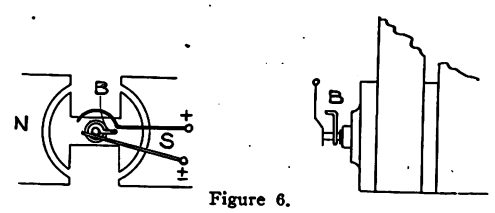

Figure 6.

relied upon to fit this scheme to the particular generator with which you have to deal. This concerns such details as the mounting of the springs, etc.

Figure 7 shows the wiring of line and telephone ringing circuit. A push button on the telephone keeps the alternating current spring of the generator normally connected. When it is desired to call central the button is pressed, throwing in the pulsating current. At central the drop must be operated on a local circuit by bat-

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tery. A special relay is put in place of the drop to receive the line current. This relay is specially built to respond to direct or pulsating current, but not to alternating.

In applying the attachment to the generator, care

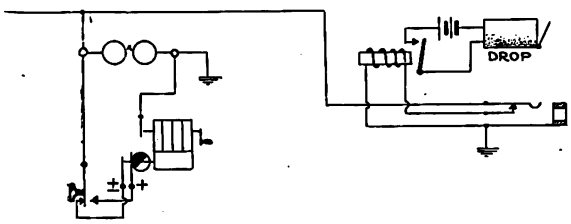

Figure 7.

must be taken not to interfere wtih the automatic cut out which disconnects the generator from the line when the crank is at rest.

Editor Sound Waves: I have heard that some automatic telephone systems operate on the principle of fast and slow relays. How does this operate and is the principle good? I mean, can it be depended on to work all right all the time? Please answer in next month's Sound Waves.—T. L. M.

The fast and slow relay principle is a safe one. Quick acting relays can be made to operate as fast as 100 cycles per second, though it would not do to depend on them at that speed for regular work. Slow relays can be made to hold up for two seconds after the current has been cut off. This being the case, it will be apparent that the margin of safety is large.

The principle on which such relays may be made to operate is shown in Figure 8. The quick relay may have for its main function the opening and closing of circuit

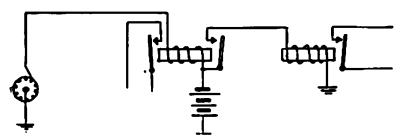

Figure 8.

No. 1. The slow relay has for its work the holding of circuit No. 2 closed as long as the quick relay is operating, but should fall back when it ceases. The auxiliary work of the quick relay to feed intermittent current to the slow relay to keep it pulled up till the quick relay is through with its work. The slow relay pulls up quickly as the first impulse comes, bu there is not time enough between impulses for it to fall back.

Editor Sound Waves: Which is harder service on dry cells, sparking an automobile or gas engine, or talking in a magneto telephone?—C. G. S.

The telephone will get more out of a dry cell than the gas engine. On account of the large current which the spark coil of the engine requires, it rapidly pulls the voltage of the cell down. But after the battery has been run low enough so that it will not spark the engine reliably, it can still furnish talking current for a telephone for some time. But after a telephone has gotten through with a dry cell, the gas engine cannot use it. It is well known to those who have tested battery that you can get much more energy out of a cell by taking small current than if you try to pull large amounts at one time.

Editor Sound Waves: Can a telephone line be crossed with another without showing on the switchboard? I refer to ground return magneto lines. Recently I had the following experience: I noticed two of our country lines wrapped together at a railroad crossing at the edge of town. I called up from the nearest telephone, had the operator test by ringing and found both lines clear. I thought I would wait till morning and see what would happen. Next morning those two lines were on the trouble hook. I went out, cleared them at the crossing, and they tested O. K. I am rather new in the telephone business, and would appreciate knowing why this acted in that way.—B. T.

It is almost certain that your case was caused by rusty wires. It does not take long for wires across railroads to rust, owing to the gases in the engine smoke. When your lines got wrapped together the rust acted as an insulator and kept them apart. Probably during the night you had more wind, which swung the wires back and forth, making them slide on each other to some extent. This rubbed the rust off and brought them into electrical contact.

Editor Sound Waves: How hard should the parts of the plug and jack be in a telephone switchboard? Should they all be the same? Is there any way to adjust the hardness so that the board will last longer and not get out of service so soon. —M. J.

It has been held by telephone engineers that all portions of both plug and jack should be as hard as it is possible to make them, provided in so doing the good contact were not impaired. Their argument has been that all portions should wear as long as possible without regard to where it occurs. Others have held that those portions of the plug and jack which are most easily replaced should be made of softer material to take the wear instead of the parts which are hard to get at. In the two-wire plug and jack, the tip of the plug is easily unscrewed and a new one put on. But the tip spring in the jack is relatively hard to replace. Inasmuch as they rub on each other, the argument was to make the tip soft and the tip spring hard. Also the sleeve of the plug is practically the body of it. But the sleeve of the jack can be made to unscrew with a special tool and easily replaced.

This is a point about which it would be interesting to have data from those who are operating all kinds of boards.

Editor Sound Waves: I have been a constant reader of your paper and would like to have you tell me how to strengthen a long span of cable which we are thinking of putting up. The place is 200 feet long the nearest we can place the poles. Is that too long? How can we arrange it, for we can not put the poles closer.—A. N. T.

Figure 9 shows a simple way to hold up a long cable span. Use poles on either side which are large and

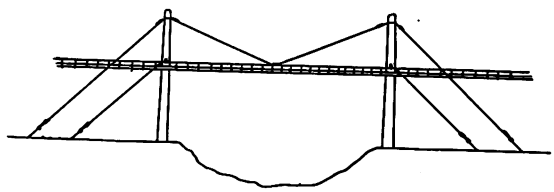

Figure 9.

strong, and extend several feet above the cable. The extra messenger runs from the top of the two poles to the center of the long span to hold it up. Put down good, strong anchors at each end, and it is well in most cases to side guy as well.

Editor Sound Waves: We are figuring on a small common battery switchboard and would like to ask if it is possible to make the line lamp operate also as a supervisory. Can it be done? If not too much trouble I would appreciate having the circuit published.—C. N. N.

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The use of the line signal as supervisory also is not new, having been worked out and used successfully in cities in private branch exchanges. Figure 10 shows the ordinary way of doing it. The line relay is inserted in series with one side of the line. To prevent its having any bad effect on the talking current it is shunted with a non-inductive resistance. In case the line is too long to work properly with this arrangement, a higher resistance relay is used with a 2 M. F. condenser shunted

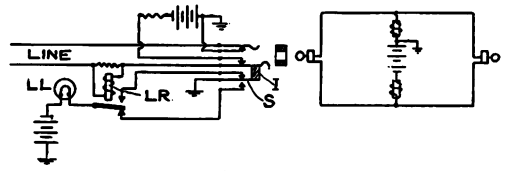

Figure 10.

around it to allow the passage of talking current. The line jack has two inside contacts which feed battery to the line. The resistance is inserted to prevent trouble in case the wires should get shorted at the jack. Three extra springs are connected to one of the jack springs by a piece of insulation, *I*. When the plug is inserted in the jack, the pressure against the spring forces the long, extra spring out, thereby changing its connection.

In normal operation, the subscriber comes in on the line and pulls current from the battery through the line relay. This lights the line lamp. When the operator plugs in, the inside contacts are broken, cutting off the battery connection for signalling and substituting the cord feed, which in this case is the Stone system of two retardation coils. Thus current is still flowing through the line relay. But the insertion of the plug pushed the spring, *S*, away from its inside contact and brought it against the outside contact. This puts the line lamp out.

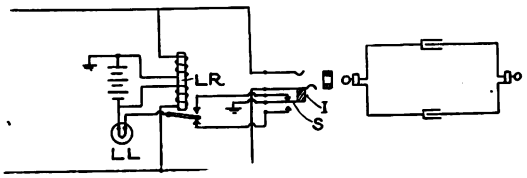

Figure 11.

If now the subscriber hangs up, the line relay falls back and by its back contact and the outside contact of spring *S* lights the line lamp again.

To free you entirely from having to talk through the line relay, the circuit shown in Figure 11 has been devised. It is self-explanatory. It has the added advantage of using the retardation-coil-condenser system of transmission, which is better for general purposes than the Stone.

Editor SOUND WAVES: What is meant by the term, "jack per station" which I hear used in connection with switchboards? I think it has reference to party lines but do not know just how it is applied.—V. D. J.

The term "jack per station" refers to the practice of some companies of assigning to each station on a party line a separate number. Thus on the same line we might have the numbers 100, 129, 23, and 591. There would be only one pair of wires leaving the central office, and it would be tapped off to all the stations as in any case. But in the office the multiple jacks bearing the numbers above mentioned would be tied together by cross connections on the intermediate distributing frame. Then this would be cross connected to the answering jack and lamp of one of them. No matter who on the line called central, it would light the same lamp and be taken care of by the same operator. But if a call were made for any station on the line, it would be called for by the particular number designated by the directory. The operator would plug up into the multiple into jack No. 100 or 129, as the case might be.

By doing this way it kills two birds with one stone, but in so doing is rather wasteful ammunition. The first is that by properly arranging the circuits it is possible to ring selectively four parties on the line without party line keys or master keys. Secondarily it allows the telephone company to give people the idea that they are getting individual line service, since their names appear in the directory with totally different numbers. If two of them happen to call central at the same time, it is easy to say that the lines were crossed. But the difficulty is that in carrying out the jack per station plan we are using up just as many multiple jacks on the switchboard as if all lines were individual. As the cost of the switchboard is considerable, it is an item to be seriously considered.

Editor SOUND WAVES: Thinking that the following case of trouble might be interesting to your readers I am enclosing a sketch of the circuit.

In the installation of a certain switchboard, each operator's position was provided with three pilot lamps, line pilot (white), supervisory pilot (red), and a ringing pilot (green). The last lamp would light by a relay placed in the ringing leads to give the operator notice if the line was open or closed. On one position it was noticed that when any line was shorted in the multiple (the usual way to test a line to get its line lamp to burn), its line lamp would burn O. K., but the ringing

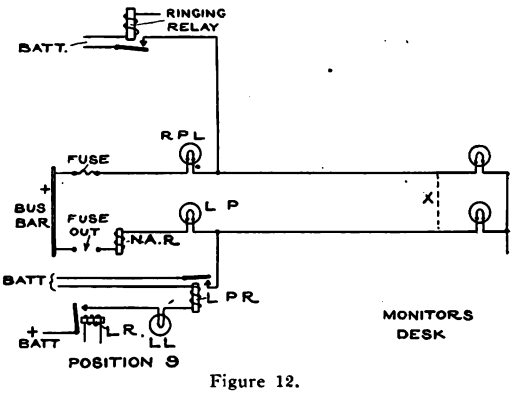

Figure 12.

pilot came up instead of the line pilot. At first it was suspected that the pilot lamp wires had been transposed, as they were close together. Inspection showed that not to be the case. My enclosed sketch [see Figure 12.—Ed.] shows what caused it. It was found that there was a cross between the wires at *X* on the monitor's desk. This would have made both lamps burn if it were not for the fact that at the same time the fuse in the line pilot common has not yet been put in. It was the combination of troubles that made it interesting. —M. K.

A Problem for Our Readers.

Required, a circuit for a common battery private line. There are to be two stations on the line, both to draw talking current from the same battery. Signalling must be done with the same battery as talking, which shall be 24 volts. Two wires only are to be run to each station, but ground return may be used for signalling if necessary, though it is preferred to keep clear of ground. The object is to devise the simplest and best circuit, employing the simplest apparatus, which should, if possible, be standard, not special construction. However, no limits are placed except that whatever is proposed must be good engineering.

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The Law and the Telephone

By William J. Murdoch, Jr.

TELEPHONE COMPANY AS INSURER AGAINST INJURY.—The Gainsboro Telephone Company operates a telephone system in Somerset, Ky., and maintains a pay station at the Newtonian Hotel. Frank J. Brucker, while a guest at the hotel, was using the pay station to talk to his wife in Louisville. The telephone did not seem to work well, and he took hold of the metal arm with his hand to raise the mouthpiece. When he did this he received a severe shock of electricity, which knocked him to the floor, rendering him unconscious and injuring his nerves. He suffered from the shock about a month, and brought this action to recover against the telephone company for his injury. On the trial he proved the facts stated. The telephone company introduced proof to the effect that the instrument was examined by one of its men in ten minutes after the accident and found it to be all right. It had not been out of order before and the cause of the accident was entirely unexplained. There was no storm at the time, although a high wind was blowing. An electric light was burning in the booth, and the electric light company had its wires in the hotel and throughout the town. These carried 2,200 volts of electricity. The voltage of the telephone system was 75 and was not sufficient to hurt anyone. No one was in the booth at the time the accident occurred but Brucker, or knew anything of the trouble until he fell to the floor.

The plaintiff asked the trial court to instruct the jury that it was the defendant's duty to so maintain its wires and appliances at its pay station as to protect from danger those who used them, and that, if it failed to do this and Brucker was injured by reason of the appliances not being free from danger, they should find a verdict in his favor. The court refused to so instruct the jury, and instructed them that they should find for the plaintiff if they believed from the evidence that the defendant carelessly or negligently failed to so protect its wires and appliances, etc., and that such negligence was the cause of plaintiff's injury.

The jury found for the defendant, and plaintiff appealed the case to the court of appeals of Kentucky, which affirmed the judgment in favor of plaintiff, and said:

"Those handling electricity where the voltage is such as to endanger human life must exercise a very high degree of care for the safety of others, but where a less voltage is used, which is not of itself dangerous, those who use it are only liable for ordinary care. A telephone company is a common carrier of messages and not of persons. The duty it owes to a customer using one of its instruments is not different from that due to their customers by other persons inviting the public upon their premises for the transaction of business. In all such cases the person so inviting the public is not an insurer, but must use such care as may be reasonably expected of a person of ordinary prudence under the circumstances. In 1 Thompson on Negligence, Sec. 970, the rule is thus stated: 'In these cases—if we except the case of passenger elevators in buildings, separately considered—the law is reasonable, and does not demand of an owner of property more than the exercise of ordinary care with respect to the rights of third persons; but, on the other hand, it does demand the exercise of due, reasonable or ordinary care.'

"The plaintiff offered to show by witnesses that a short time prior to his injury, a person, in using another telephone in the city, received a severe shock of electricity. This evidence was properly rejected. The condition of another telephone at another time was purely a collateral matter. The question the jury was to try was whether the defendant had exercised ordinary care with the telephone at which he was injured. It is a matter of common knowledge that wires sometimes get crossed, and the fact that another telephone was on another occasion out of order would have thrown no light on the case at bar."—100 S. W., 240.

TELEPHONE FRANCHISES COMPARED.—In 1884, the city of Salem, Oregon, granted to George S. Ladd, his associates and assigns, a 50-year franchise to erect, maintain and operate in the city a telephone system, and to use the streets, alleys and thoroughfares therefor, the wires to be strung on poles or other fixtures above ground or laid underground in pipes, as the grantee might elect, in consideration of which the city was to use the poles and conduits free for fire alarm and police telegraph, and the grantee was to furnish the fire department with telephones in the engine houses and in the city hall free of charge. Later the Pacific States Telephone Company succeeded to Ladd's rights in the franchise.

In 1891 a controversy arose between the company and the city respecting certain fees or taxes, in the settlement of which it was agreed that the company should pay to the city $200 annually for ten years, and the city should not during such time grant any franchise for a telephone system upon terms more favorable than those under which plaintiff operated and maintained its system. In November, 1905, the city council granted to one Sumner a 25-year franchise for a telephone system, requiring that all main lines and wires (except necessary feed and house wires), within the fire district, be placed underground, and that the grantee should, after the first year, pay to the city one per cent on its gross annual receipts, and was also to furnish, maintain and keep in repair five telephones for the use of the city. It was also provided that the grantee, or the corporation organized for the purpose of carrying on the telephone business, and to which he might assign the franchise, should not, without the consent of the city, sell or transfer the franchise or plant, and should not at any time enter into any contract, directly or indirectly, with any person, firm or corporation, concerning the rates to be charged for telephone service.

The grantee was also required to give to the city a bond in the sum of $5,000, conditioned that he would, within eighteen months, have in operation not less than 400 telephones. A few days after the granting of the franchise a suit was commenced by the Pacific States Telephone Company against the city and Sumner, to enjoin the latter from constructing, maintaining or operating his proposed system, on the ground that the franchise granted to him was more favorable than the one under which the company was operating, and therefore in violation of the contract referred to between it and the city.

The suit was dismissed in the trial court, and the Pacific States Telephone Company appealed the case to the supreme court of Oregon. Here the decree of the lower court was affirmed in an opinion, in part as follows:

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"The plaintiff grounds its right to relief on the contention that the franchise to Sumner is more favorable in its terms than the one under which it operates. The burden of proof is upon it to establish this fact by satisfactory evidence, and this in our opinion it has not done. The two franchises differ so essentially that it is practically impossible to determine with any degree of certainty whether one is more favorable than the other. The plaintiff's franchise is for 50 years, the defendant's for 25. The plaintiff may support its wires on poles within the fire district, while the defendant is compelled to put his underground, which is admittedly more expensive. The plaintiff has to furnish three telephones, and the defendant five. The plaintiff has to pay $200 a year for ten years, and the defendant one per cent on gross receipts during the lifetime of the franchise, except for the first year. The principal contention of the plaintiff is that the payment of $200 a year for ten years is the more burdensome than the payment of one per cent on the gross receipts of the defendant for 24 years; but this necessarily depends upon so many future contingencies that any consideration of the question is mere conjecture, and too speculative to justify a resort to the extraordinary remedy of injunction."—89 P., 145.

TELEPHONIC COMMUNICATIONS IN EVIDENCE.—Where plaintiff's former cashier called the office of defendant commission company in another city by telephone, inquired for the head of the concern, and was later told that he could talk to the person he desired, and he thereupon talked with some one connected with the commission company, and inquired whether certain drafts drawn by M. would be paid, and was answered in the affirmative, evidence of such communication was admissible against defendant, though such cashier did not recognize the voice of the person to whom he talked, and could not say who such person was.—Godair et al v. Ham. Nat. Bank, 80 N. E. (Ill.), 407.

Where a hospital suing a corporation for the support and treatment furnished to its injured employes, showed that the hospital received a telephone call purporting to be from the office of the corporation, asking for the dispatch of an ambulance for men who had been injured, proof that the agent of the hospital in charge of the telephone inquired at the time who would pay for the treatment, and was informed by the person telephoning from the office of the corporation that it would take care of the expense, was admissible as a link in the chain of circumstances to establish the liability of the corporation.—General Hospital Society v. New Haven Rendering Co., 65 A. (Conn.), 1065.

CARE COMMENSURATE WITH CONDITIONS.—In an action for injuries to plaintiff by coming in contact with a broken telephone wire, the petition alleged generally that defendant's wires were negligently constructed, and specifically that they were not properly insulated nor substantially attached to the poles; that they were strung in close proximity to electric light and power wires, so that they would likely become charged, burn, break off, and fall from their fastenings; that by reason of such negligence defendant's wires fell, became charged with electricity from a trolley wire, and that plaintiff came in contact with them and was injured. *Held,* that an instruction that if defendant maintained its wires directly above the trolley wire, which was heavily charged, it was its duty to use care commensurate with the conditions to prevent the wires from coming in contact, and if it failed to use the care of a reasonably prudent person to so fasten its wires that they would not fall, etc., and one of its wires did fall and plaintiff was injured therefrom, she was entitled to recover, was not objectionable as not within the issue.—Pilitowitz v. Citizens' Telephone Co., 99 S. W. (Kans.), 756.

MISTAKE IN CALLING WRONG NUMBER.—Where real estate brokers, attempting to call up the owner of land by telephone, by mistake called up another real estate broker of the same name, and the latter made an appointment to bring them into personal communication with the owner, who finally agreed to sell the premises to them, the broker thus called up by mistake is not entitled to compensation for his services.—Shapiro v. Shapiro et al., 103 N. Y. S., 305.

Testing and Locating Trouble*

By H. E. Custard.

THIS is a broad subject and applies to troubles in any part of a telephone system. So broad is it in fact that I have decided to confine myself principally to line and instrument troubles.

It is not my intention to bring out anything new in the way of testing and locating trouble, but to offer a few suggestions, perhaps, to those who are sometimes annoyed by the stubborn or so-called "chronic" cases.

I have been requested to treat the subject from the standpoint of those who have to do with the small magneto call exchanges and who are usually handicapped by the absence of the voltmeter, galvanometer, etc., for testing purposes.

Just as soon as a telephone plant becomes operative troubles begin to develop and unless they are located and cleared as fast as they become evident the system would soon be unfit for service. Of course the amount of trouble any telephone plant is subject to depends largely upon its physical condition, yet in the best constructed plants there will be sufficient trouble to warrant close attention on the part of the management. It is not the simple troubles of every day work, such as "can't call," "can't hear," "bells don't ring," etc., that are most annoying. Those that are not there while we are looking for them, or those that are there without any apparent reason are the ones that make us scratch our heads and think how fate has given us one more chance to show our ability. The latter are the ones that interest us the most.

Ordinarily the apparatus found in the smaller exchanges for testing lines consists of a telephone near the rack and a lineman's test set. These, with a good receiver and a few cells of battery, are sufficient to detect, and go a long ways toward locating nearly any trouble a telephone line is subject to, if skilfully used.

Surprising results may be obtained by the use of very simple apparatus. The common receiver is too little appreciated as a testing instrument. Its wonderful sensibility may be compared with that of the most delicate galvanometer, while its substantial and simple construc-

*Paper read before the Michigan Managers' Association at Battle Creek.

tion, small size and great reliability, permits its use in places where the delicate and easily deranged galvanometer would be worthless. It is difficult to understand why the inspector makes such little use of the receiver in his daily work. It should mean as much to him as the voltmeter does to the man on the wire chief's desk.

For testing out condition of cables it is the best instrument around the small exchange, yet many men depend solely on the magneto. The magneto is very un-

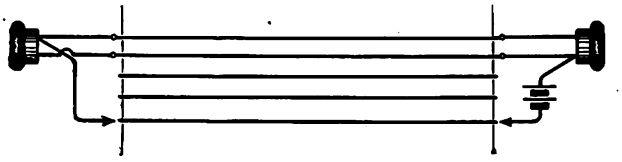

Figure 1.

reliable for this purpose except for cables of comparatively short length. The kind known to cable splicers as "three wire" receivers are the handiest for this work. (Figure 1.) An open fuse in a cable terminal may be detected by simply listening across it, for if it is good the receiver is shorted out and therefore "dead." If the fuse is broken, line noises can be heard.

Generally, in the smaller exchanges, the available apparatus for testing is so inconveniently arranged as to discourage its use and prevent the attainment of rapid and accurate results.

Test batteries, if used at all, are allowed to kick around about the rack; no regular receiver is fitted with cords and clips as it should be, but instead one is taken from stock, or a nearby telephone when required for use. The magneto at the rack has no keys wired into the circuit to facilitate making the necessary circuit changes for various possible tests. The time saved and better and surer results obtained will doubly repay the few hours spent in fixing up in permanent form some convenient and reliable, though simple testing device. A double locking operator's key attached to a good series magneto telephone will provide means for making every circuit change required for any test that can be made with such a test set and it is surprising how much can be done with this simple apparatus. The line to the telephone should pass through a double locking operator's key and a six-point plunger key. (Figure 2.) In their normal position these keys leave the telephone in exactly the same relation to the line as though they were not in the circuit. The double locking key is wired in such a way that when thrown either way from normal, one side of the telephone is grounded and the other side is

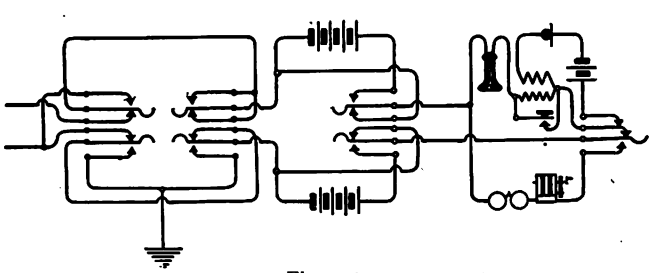

Figure 2.

put to the tip or sleeve side of the line as desired, depending on which way the key is thrown. This permits of ringing "grounded" on the line to test for leakage and also of listening between the line and ground on open circuits to determine the approximate distance to the break. Nothing will show so well as this test whether you have any "line" or not, and the first impulse on testing, after the habit is once acquired, is to listen grounded.

The plunger key has a set of eight or ten dry cells connected to its outside springs, these cells being cut in circuit with the telephone when the key is operated. A great many tests may be made by their use and they should, by all means, be installed. Cutouts in subscribers' telephones or in the lines may be located with great facility. You all know how a common battery line sounds when something is loose in the circuit. Cutting these cells in at the test telephone gives exactly the same effect. If you have a loose transposition somewhere in the line and listen in with the battery, the hum of the wires may be heard as plainly as though you were driving along the road within a few feet of the lead. Shorts in the line may show up in the same way because such crosses are seldom so solid as not to vary more or less in resistance and any change in resistance of the loop under test is made evident in the receiver. The humming noise determines at once the fact that the trouble is outside of the telephone.

Swinging crosses or grounds give noisy evidence of their presence and permanent troubles of this nature in cables or lines may be tested by listening while working the plunger key. The ingenious man will find many applications for this test and when once accustomed to its use there are few things he would be more willing to do without.

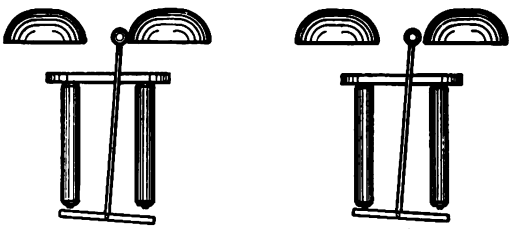

Figure 3.

When the usual inspection fails to reveal any apparent cause for a complaint, examine the telephone very thoroughly in every part and look over all connections. A very common and serious trouble is a cutout in the secondary or receiver circuit. Cutouts in the primary or battery circuit are less common and make themselves evident through the scraping noise they produce. Still it is well to make sure of the connections in this circuit also, especially those on the battery.

A good way to locate a cutout in the secondary circuit is to place a couple of dry cells in series across the line posts and then listen in the receiver while shaking the hand cord or extension cord, if the instrument be a desk set. This is a simple test and sure of results.

The later designs of switch hooks are less liable to give trouble than their predecessors, but it is well to see if all wires are securely soldered to the springs and that the contacts work properly under the motion of the switch arm. Adjust them so that in making contact one spring will push the other a perceptible distance before the motion ceases. It is not sufficient that they barely touch or only seem to touch. Make sure that the circuits are changed as they should be, especially the primary, which must be open when the telephone is not in use lest the batteries run down. The lever must work freely and not bind. While giving a positive action it should not be too stiff to allow the weight of the receiver to pull it down.

The ringing circuit is not apt to give much trouble of an intermittent nature. If a ringer is "polarized" the safest way is to change it for a good one, though much

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may be done by adjustment. To adjust a sticking ringer, pull the armature pretty well back from the magneto and then set the gongs so close to the striker that when pulled over, the armature will be prevented from making actual contact with the pole pieces. (Figure 3.) While less sensitive, this adjustment will in many cases give perfectly satisfactory ringing, especially on individual lines.

The generator is a reliable piece of machinery and outside of the automatic shunt and "cut in" gives rise to a little special trouble. In a bridging telephone it is of most importance that the "cut in" springs open properly when the generator is at rest, otherwise the low resistance of the armature is left across the line which makes ringing from other telephones almost, if not quite, impossible. More than one annoying case of trouble on bridged party lines has been traced to this very point. This trouble is often intermittent and sometimes difficult to locate.

After thoroughly inspecting the telephone, go over the inside wiring and look for corroded joints and wet spots, either of which will interfere with the proper working of the line. If in very bad shape rewire the job and avoid running the wire where it is liable to get wet or even damp. The only reliable joints in inside wiring, including the ones at the drops, are soldered ones. Of course a magneto telephone will sometimes work quite satisfactorily through a fault that would put a central energy or automatic telephone entirely out of order, yet even for the magneto work, especially bridged party line service, the house wiring cannot be too carefully done.

When looking up a "chronic" case of trouble, the greatest care should be used to inspect the line for loose connections. Don't pass a joint simply because it looks good, especially one that is not under strain, such as transposition splices, jumper and service wire connections. Connections of this sort are not apt to be fully appreciated as trouble breeders. A very easy and sure way to test a suspected joint is to connect a receiver across it and listen while someone rings or talks on the line; if the splice is a good one the receiver will, of course, be short circuited just the same as though placed across an equal length of solid wire and no sound can be heard in it. But if the connection is poor and interposes more or less resistance in the circuit, the fact is at once made evident by noise in the telephone. (Figure 4.)

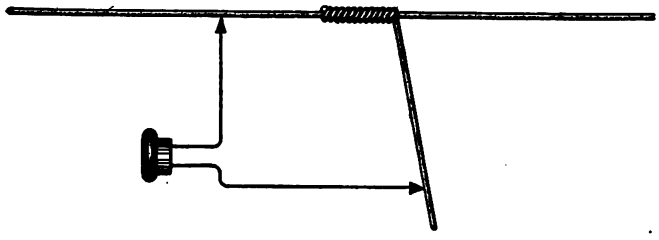

Figure 4.

Each side of the line in its entire length from the switchboard jack to telephone binding posts should show practically the same resistance as a solid wire of the same length and gauge. A partial short circuit causes serious trouble with signaling, especially on heavily loaded bridging party lines, and is often quite difficult to localize, but patient persevering and systematic tests are sure to overcome the difficulty. If of an intermittent nature it may take several days to clear the trouble. A thorough knowledge of the circuits, such as their length, position in lead, length and number of branches, if any, number and location of telephones, etc., is a valuable asset of the repairman when looking for faults of this kind, as indeed of any kind.

On bridging lines it may sometimes be necessary to disconnect the wires at every telephone and then, if the fault is still present, the different branches may be opened until the trouble is located in one of them. An inspection of this part of the line will probably soon reveal the cause of complaint.

Nothing should be taken for granted, for oftentimes things are not what they seem and the repairman may save himself much unnecessary work by investigating on the start everything of a suspicious nature that could possibly be a "bug" in the wire.

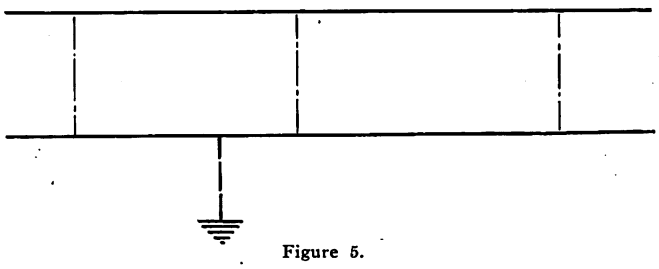

Figure 5.

To those that have grounded or common return lines and are troubled with noise and cross talk, I have little to offer for their relief, for in practice it is nearly impossible to avoid such annoyances altogether on account of being unable to obtain a perfect balance on all the lines.

It is well to be sure that the lines are well insulated and the grounds at the telephones and central office are perfect. When a common return is used the joint at every tap should be perfect. Sometimes cross-talk will be caused in the switchboard and one should not be misled by this fact. One of the common causes is the drop windings being crossed with the frame.

If the above precautions are taken in connection with full metallic lines, chances for noise and cross talk on the lines are small, although it may be necessary to transpose the circuits where they parallel each other or some light or power circuit for some distance. If a single line is near to disturbing wire it will do no good to transpose.

If a voltmeter test were made of the lines of the magneto call exchanges, which have been in operation for several years, it would surprise a good many telephone men and explain the cause of some troubles which have puzzled them. Circuits which normally should show a resistance of only a few hundred ohms would test from one thousand to five or six thousand ohms, others would test too low, indicating a partial short or leakage.

Not all metallic lines that have bad grounds on them are necessarily noisy. A short line may often be very quiet even though the ground be of low resistance. This is especially true in rural districts and where there are no electric light or power lines to cause disturbance. But if a line runs through a region infested with trolley and high tension circuits, the slightest ground may cause a bad noise; the longer the line the more noise. The amount of ground to make a metallic circuit noisy depends on the length of line and the intensity of disturbing influences. When a line possesses fairly high insulation resistance and is properly transposed and well balanced there will be little, if any, trouble from noise even in regions infested with power and light wires. It is during a connection with a long toll circuit that a faulty line shows at its poorest and this, of course, is just the time when it should work at its best. A frying noise

coming from a faulty primary circuit in the telephone might sometimes be mistaken for line noise, but shorting the line at the terminals will show you at once whether this trouble is in the instrument or the line.

The listening test for locating disturbances is simple and effective and may always be used, no matter what is the cause of disturbance. The test consists only of listening on the line while a lineman shorts it out at various places, the noise disappearing as soon as the short is placed between the trouble and the test telephone, because the line being in balance between the two points allows the disturbing currents to divide equally between its two sides, hence no noise is heard in the receiver. (Fig. 5.) This method is of especial importance in the toll line work, for after locating the trouble between two test stations there should be little difficulty in running down the fault in this section by listening.

Many times a telephone works badly and the troubleman will advise you that the instrument is O. K., the line tests clear, and there is no apparent reason why the service should not be all right. If everything is as it should be the telephone is bound to work perfectly; it can't help it.

Now if a subscriber says his telephone doesn't work right you may be sure that in nine cases out of ten there is trouble somewhere. Perhaps it is some other line he is trying to talk with, but the result is the same and a systematic and thorough inspection will reveal some simple fault that is not half so mysterious as we perhaps thought it to be.

Above all things never jangle with a subscriber. Let him feel that you realize he has just cause for complaint, that you are interested in his case, and are making a willing effort to remedy every defect in his service. When a case is invisible, sometimes apparently impossible, get from the subscriber the most minute and seemingly unimportant details, then sit down and think out what combination of circumstances would produce the trouble, and ninety-nine times out of a hundred, if we go far enough and dig deep enough, we find what we are looking for.

Sentiment has been responsible for much of the success of the Independents in the past. Today, sentiment is much less in evidence. It is the company that gives the best service at a reasonable rate that gets the business and it is the trouble end of the business that plays a mighty important part in the service.

Specifications for the Construction of Underground Conduit

By Sherburne D. Levings

THESE specifications are intended as a guide to smaller companies contemplating the installation of underground conduits without the aid of a construction company. There is no reason why the underground conduit system cannot be installed in the majority of plants, but the fact that in such plants men especially versed in this kind of work are not always at hand and that good working specifications are not attainable, the installation of a beneficial underground plant is often delayed.

The methods herein set forth are reliable and much of the work in the larger systems has been performed along these lines. The article will endeavor to treat in detail all the phases of underground construction, and it is hoped that some questions may be made perfectly clear to any one interested in this most important portion of the distributing plant.

These specifications deal almost entirely with the all encased concrete class of construction, it being acknowledged by nearly all engineers that within corporate limits the hazard to telephone conduit is greater than on any other kind, and also that all precautions should be taken to preserve the conduit free from interference, thus guaranteeing continuity of service to the subscribers through the cables contained in the ducts.

Two alternative methods of country construction for underground conduit are given, which it is believed will care for any phase of the work outside of the standard methods adopted by all of the larger operating companies. It has been determined that a casing of three inches of concrete completely enveloping the ducts will give ample protection, so these specifications are written with the belief that this class of construction will be accepted as standard.

Test Holes.—In cities or towns having a network of underground structures, such as water pipes, gas mains, conduit systems of electric light companies, and where accurate locations of these various structures cannot be obtained in the city engineer's office or elsewhere, the following procedure is recommended. Before excavating the trench for conduit, test holes of approximately 8 feet long by 2 feet wide by 6 feet deep should be opened to ascertain the location and character of obstructions which may be encountered and to determine the advisable conduit location. As a rule two test holes should be excavated, one at the end of each block, and should be dug at the street intersection. The first test hole should be extended from within two feet of the curb line to within two feet of the center line of the street. From the information disclosed by the first test hole, a tentative line for the conduit run will be selected. All test holes after the first shall be extended at least one foot beyond the sides of the proposed trench. Where car tracks are present in a street, it will not be necessary to extend the first test hole toward the center line of the street beyond a point two feet from the nearest outside rail.

From information obtained from this series of test holes and by a survey of the surface of the street, a decision may be reached as to the location of the conduit run, avoiding sewers, pipes and other underground structures. On account of sewers, conduit shall never be located in the middle of the street.

Excavation of Trench.—In excavating the earth from the trench, the paving of surfacing material of the roadway shall be placed to one side, so as to be available when resurfacing the trench. When the trench is excavated in parkways, lawns, or private rights-of-way, care should always be taken to cut, remove and preserve the sod and to replace it upon completion of the work. The dirt excavated from the trench should be placed on cloth, burlap or other suitable material to protect the grass.

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The trench for the conduit should be excavated to

such a depth as will leave between the top of the protecting plank or concrete over the conduit and the grade of the street, a distance of not less than 24 inches, except in special cases to be determined by the superintendent of the work. The width of the trench shall be such as to allow convenient laying of the conduit and to allow between the wall of the duct and the side of the trench a distance of not less than three inches. Before installing the conduit, the trench should be opened to its full depth, a distance of 200 feet in advance of the conduit being laid.

The sides of the trench should be cut clean and vertical from a point level with the conduit formation top to the bottom of the trench. From the top of the conduit formation to the surface of the street the sides of the trench may slope, if the soil is of such a nature as to make this method less expensive than shoring. Otherwise, where necessary, the sides of the trench may be shored to prevent caving. When blasting is required this work should be performed by a licensed dynamiter.

The trench should be kept free from water by draining, pumping or bailing. Any springs encountered should be thoroughly drained, when practicable, and soft places removed and filled in with well tamped concrete. When gas, water or other pipes are met with the work should be so carried on as not to interfere with them, and they should, when necessary, be supported securely in place by cross braces and chains or other suitable means until the filling has been rammed solidly around them.

Where it is necessary to lay conduit through the position occupied by water, gas or other pipes, or the property of another corporation or individual owner, the obstruction should be removed only on written consent of the owner, and when said consent for removal cannot be obtained the conduit run should be changed to avoid the obstruction.

Where it is necessary to include water, gas or other pipes in the protecting concrete surrounding the conduit, such pipes should be surrounded with broken stone, sand or gravel to avoid damage to the surrounding concrete through the removal of the pipes.

The bottom of the trench should be well leveled. The following methods will assure the grade of the trench to be such as to afford efficient drainage to the ducts. The summit shall be midway between the vaults, and shall be of such a depth as will allow 24 inches between the top of the protecting plank or concrete and the street grade. The slope toward each vault from this summit shall be such that the top of the conduit entering the vault shall not be less than 30 inches from the grade of the street. In case it is impracticable to grade both ways from the summit the grade may be continuous from one vault to the next. The summit for two consecutive lengths shall be at the same vault and then at alternate vaults, so that the ducts in the same vault will enter on the same level. On inclines or slopes it will not be necessary to grade the conduit as the conduit will follow the natural grade or slope of the earth. The grade may be determined by a spirit level with a sight attachment.

Method of Laying Conduit.—Conduit should always be laid in a straight line. Where necessary to avoid obstructions or to conform to the changes in the line of the street or alley, conduit may be laid so as to vary slightly from a straight line.

Single Duct Conduit.—When single duct conduit is laid, it shall be placed on the concrete bed and well settled into place. Where two or more ducts are being laid, they shall be placed so as to break joints. Stakes shall be used when the formation consists of four or more ducts. These stakes should be of creosoted lumber, 3 in. by 1½ in. by 3 in. These stakes should be driven on either side of the duct formation at intervals of 6 feet. They should be sharpened at the bottom end to facilitate driving. The top of the stakes should be bound together by means of a cleat of the same size lumber as the stakes cut to length and drilled for two 3½-inch wire nails. The concrete should then be filled around the ducts and the street resurfaced.

Multiple Ducts.—The trench should first be prepared with a foundation of three inches of concrete, well leveled and tamped. Upon this the tile should be well leveled and placed in a settled position. The dowel pins should then be inserted, dropping the next piece of conduit into line. The joints should be covered by a piece of burlap about six inches wide, wet, so as to adhere to the tile, to prevent the entrance of concrete into the ducts. The successive lengths of tile should then be placed in a similar manner. When two or more sections of tile are laid side by side, the joints should be staggered. In joining two, three and six duct sections, one dowel pin at least should be used, or two if the duct is designed for more than one. When the ducts are in position they should be enclosed with three inches of concrete at the sides and top.

If the conduit run is of large cross section, it should be built up in tiers. When the first tier is laid and lined up, the sides of the trench should be filled in with well tamped concrete to a thickness of three inches and to a height flush with the top of the tile. The upper tiers shall then be laid successively one upon the other in a similar manner to the first tier. The completed section should then be enveloped in the three inches of concrete after which the trench should be refilled and surfaced. In dumping the concrete into the trench and in laying the conduit, care should be taken to not knock off earth into the trench. Any dirt falling onto the work must be carefully removed before proceeding. Care should be taken at all times in tamping the concrete and refilling the trench, not to disturb the conduit or the concrete partially or wholly set.

There are two alternative methods of laying conduit without corporation limits such as toll cable conduit, trunk conduit connecting a suburban town with the city or in other words where there is no hazard from picks, steam rollers and other implements used in the construction of underground structures.

The first method is to lay the conduit upon a three inch bed of concrete. Upon top of the tile place two inches of loose dirt, free from large stones, and upon this layer of dirt place a 1½ inch creosoted plank of the width of the conduit formation.

The other alternative method is to place the conduit upon a 1½ inch creosoted plank. Upon the top of the formation place a creosoted plank 1½ inches thick. Before placing the plank two inches of loose dirt, free from large stones, should be placed on top of the conduit formation. In both of the above cases the joints should be closed by means of burlap mentioned previously.

(*To be continued.*)

Telephones Through Horse's Body.

A device by which the horse is made a part of an electrical circuit has been reported to the war department by Lieut. A. C. Knowles at Fort Leavenworth, who has been making tests of telegraphic and telephonic communications between mounted operators. It will permit the mounted man to transmit messages to his base whenever necessary without stopping his horse. A small piece of copper against the animal's body is used to complete a ground connection through the horse's hoofs.

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Monnot Copper-Clad Steel Wire

By Byron E. Eldred.

THE wonderful development of things electrical has caused copper to rank a very close second to steel in the relative importance of metals in the arts.

The demand for copper has so far exceeded the available supply that we have recently paid more for the metal than it has ever brought before. This is not strange when we consider that commercial electric traction practically dates from the electrifying of the Union Passenger railway, Norfolk, Va., by Mr. Frank J. Sprague, 1887, and that industrial electric lighting in 1877 consisted of a few hundred Jabblockkoff candles, marveled at in London and Paris.

The supply of copper is an all-important question and an invention which will allow of the segregating of its use without waste can only be regarded as most important. The lead-covered telephone cable is such an invention. This displaces the No. 14 N. B. S. open line wire with No. 19 or No. 22 conductor in cable. The larger wire while unnecessary for clear talk, being required to care for mechanical loads when exposed to weights of the ice and sleet.

Mr. J. Ferreol Monnot, an eminent metallurgist, who received his education at the Escole Superieure des Mines de Paris, has succeeded in solving the problem of welding copper to steel. The new product is now being manufactured and marketed in this country under the name of Monnot copper-clad steel.

Byron E. Eldred.

As the name indicates, this metal is a compound body composed of steel with a copper coating. Through Mr. Monnot's discovery, copper and steel have been commercially welded together for the first time in such form that a steel core can be produced with a copper coating of any desired thickness. The weld between the two metals is autogenous and so complete at all meeting points that co-extension takes place without any separation of the component metals. I have tested several sections of Monnot copper-clad steel billets by first heating with a blow pipe to such a degree that the copper started to melt, then subjecting the metal to sudden chilling by immersion in ice water. A careful microscopic examination after this treatment exposes no rending of the weld. In fact, an endeavor to separate the copper coating from the steel with a cold chisel demonstrated that it was impossible to separate the union, breaks occurring either in the steel or in the copper. Such tests, of course, will go far to eliminate the natural and very reasonable doubts arising from the consideration of the wide difference in the coefficients of expansion of copper and steel. It is quite evident that the perfect weld in this instance allows the steel to take up the excessive strain exerted by the copper and so retard its expansion along the line of contact that the direction of the expansive force is exerted at right angles to the line of union, increasing the diameter of a wire, for example, rather than its length. The longitudinal elongation of a Monnot copper-clad wire due to expansion is, I find, about equal to steel under similar conditions.

It shall be my endeavor to disclose, as far as possible, what is really known of the new metal, and for self-protection, I wish to state in advance that there is much work yet to be done in making practical applications of this product. Such work you are best qualified to do.

The metal is being produced commercially, its manufacture having long since passed the experimental stage, and consumers are assured of a supply of an evenly coated uniform product.

A combination of copper with steel in such form that the advantages of both metals should be combined in a new product free from the inherent defects of the compotent metals as used separately has long been sought. The great prospective value of such a product has caused much effort to be devoted to the study of the subject. Anything like a complete history of the prior art would consume too much time and would read so much like a similar record, should one compile the history of attempts to effect perpetual motion or devise non-refillable bottles, that it is only worthy of brief mention.

The commercial welding of copper to steel was practically classed as an impossibility when Mr. Monnot attained his success. Two notable failures or attempts to produce what was commonly known as bimetallic wire are recorded in this country. Many thousand dollars were spent by a prominent wire manufacturer in attempts to heat a billet of steel and a tube of copper and roll these together after inserting rods within the tube. The wire rods thus produced were then drawn to wire, but there was no union of the metals, except possibly some slight sticking at spots along the line of contact. Any slight after-heating of the product would bring into force the unequal expansive properties of the unlike metals, rending all union and thus destroying the sought for qualities. One of the most costly experiments was conducted by a big American telegraph company some years back, when it is said approximately $250,000 was spent in an endeavor to coat iron wire electrically. A considerable quantity of the material was produced and wires strung from New York to Boston. A few weeks of exposure caused the copper to separate and hang in shreds from the iron core.

The state of art as disclosed by Patent Office records shows that numerous attempts to manufacture such compound metallic products have been along the line of casting copper about a steel or iron core. The casting of pure copper is exceedingly difficult in itself and it is not strange that such attempts to thus form a compact, homogeneous coating about a steel base have failed, much less to form such a coating and secure it firmly welded

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to a base of dissimilar metal. The most notable work of the prior art was accomplished by Eduard Martin, of Paris, who produced, by a rolling process, a compound wire rod of copper and steel, wherein the metals were quite securely stuck together. Martin's process could hardly be classed as commercial, on account of the high cost of the product. However, a considerable quantity of the material by this process was manufactured in Germany, and some exported to this country sold at a price exceeding that of pure copper by 50 per cent.

The Monnot copper-clad steel wire embodies all of the necessary qualities of a commercial product of this nature. An absolute weld is secured between the unlike metals. This is necessary to compensate for the difference in coefficience of expansion, also to prevent the destruction of the steel core by corrosion, as a cut in the coating metal exposing the core to oxidization does not allow oxidization to proceed along the line of contact, as is the case, for example, in such material as galvanized iron, where the coating metal is worked off by continued oxidization.

A coating of any predetermined proportion to the core is effected, thereby securing such conductivity as may be desired, coupled with the necessary tensile strength, at minimum metal expense. Monnot copper-clad steel wire is cheaper than copper and material economies are effected in its use, especially where copper is employed in excess of the necessary transmission requirements of the conductor, for the purpose of increasing tensile strength.

A non-oxidizable surface is presented, which, being rolled and drawn against a backing of steel, is non-porous and presents peculiar advantageous wearing qualities where strength lays in surface skin. The wire, unlike hard drawn copper, affords a material not readily broken and which need not be handled with the same care by linemen. In fact, the copper-clad wire possesses such properties that it may be re-strung after being taken down, whereas copper would necessarily have to be scrapped.

As an example for the superior properties of Monnot copper-clad steel wire, the result of an average of six tests with a No. 26 B. & S. G., soft annealed wire composed of 25 per cent copper and 75 per cent by weight of mild steel of approximately nine points carbon, showed an average breaking weight of 12½ pounds, corresponding to 58,000 pounds per square inch, or about twice that of soft annealed copper. Torsion tests of six-inch lengths averaged 461 twists, while one sample showed the remarkable property of breaking only after 650 revolutions of the machine had been recorded. Elongation test of this sample showed 31 per cent elongation of test piece twenty-four inches long.

In comparing copper-clad wire with copper and iron the scrap value and interest on the original investments must be taken into account with life of the different lines. The first cost too often decides questions against the judgment of the engineer. The following tables of comparison of No. 14 B. & S. copper-clad wire and No. 14 N. B. S. copper wire may prove interesting. These tables were recently prepared by a prominent telephone line material expert, who assumed both wires to be in place fifteen years:

NO. 14 N. B. S. COPPER WIRE.

Weight per mile	102 lbs.
Cost per mile	$28.36
Cost of stringing	6.00
15 years of interest at 6 per cent	30.92
Cost of taking down	2.00
Total cost	$67.28
Credit scrap value present market price	19.38
Net cost end of 15-year period	$47.90

NO. 14 B. & S. COPPER-CLAD WIRE.

Weight per mile	58 lbs.
Cost per mile	$14.24
Cost of stringing	6.00
15 years' interest at 6 per cent	18.22
Cost of taking down	2.00
Total cost	$40.46
Credit scrap value present market price	6.00
Net cost end of 15-year period	$34.46
Saving by the use of Monnot copper-clad wire	13.44 per mile

Assuming studying period of fifteen years and iron wires to be replaced after seven and one-half years, the following table is a comparison of No. 14 B. & S. copper-clad wire and No. 12 B. W. G. iron wire:

NO. 12 B. W. G. IRON WIRE—EXTRA B. B.

Weight per mile	165 lbs.
Cost per mile	$ 8.46
Cost of stringing	6.00
7½ years' interest at 6 per cent	6.51
Cost of taking down	2.00
Junk value	.00
Total cost end of 7½-year period	$22.97
Total cost end of 15-year period	$45.94
Add interest on $2.00 at 6 per cent for 7½ years	.90
Total cost 1 mile iron wire for 15 years	46.84
Total cost 1 mile copper-clad wire for 15 years	34.46
Saving by the use of Monnot copper-clad wire	$12.38

It must be noted that owing to lessened specific weight, a given weight of copper-clad steel wire will string further than the same weight copper of the same gauge. Where copper-clad wire is used to displace steel in applications where tensile strength is of primary importance, a lighter wire may be used, as the original strength of the copper-clad wire may be figured at the ultimate estimated strength for the iron wire after making allowance for its deterioration by corrosion.

Mr. S. P. Grace, engineer of the Central District & Printing Telegraph Company, has subjected copper-clad wire to very severe and exhaustive investigations during the past year. In his paper presented before the American Institute of Electrical Engineers in New York, on April 26, last, and reproduced in July SOUND WAVES, Mr. Grace says: "Until recently the type of distributing wire most generally used was made of No. 14 B. &. S. gauge copper. The size of wire was not necessary for conductivity, for as a rule it was connected to a 22 or 19-gauge cable pair. It is necessary to use this size of wire for mechanical strength, because the wire is strung in spans and had to be self-supporting. During the past year there has been put on the market a copper-clad steel wire which is made by a new method known as the Monnot process. Copper is welded to a steel ingot and the copper and steel drawn out uniformly together. From all the examinations we have been able to make it seems that there is a perfect union between the copper and the steel. A No. 17 B. & S. gauge copper-clad wire having 30 per cent conductivity of copper has the same tensile strength as a No. 14 B. & S. hard drawn copper wire. This reduces the amount of material in the distributing wire one-half, and what is still more important, on account of the reduced area, decreases the amount of expensive rubber compound required to surround the wire. The amount of braid covering is also materially reduced. The finished wire is very light and easy to handle and costs approximately 43 per cent less than the No. 14 B. & S. type of wire.

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"The loop to the subscriber's premises should, however, be made with twist pair wire, for the maintenance and trouble incident to bare wire is usually prohibitive. Generally speaking, the bare wire on these side lines should be of copper, for at the present time, with so much sulphurous smoke in the atmosphere of our cities and towns, the life if iron wire is too short to give it serious consideration. Copper wire smaller than No. 14 N. B. S. or No. 12 B. & S. gauge cannot safely be used in spans because of its low tensile strength. This size of wire is not required for conductivity, since in the places where this wire is usually strung we would be satisfied with a cable conductor of 19 or 22 gauge. Here again it also seems possible to make considerable saving by the use of copper-clad steel wire. A No. 14 B. & S. or No. 16 N. B. S. copper-clad wire is sufficiently strong mechanically and has a conductivity equivalent to a 19 gauge cable pair. This will reduce the first cost of line wire about one-half. The copper-clad wire will be just as durable as copper, and since its strength lies on the inside rather than in the hardened outside shell, it will be subject to a lesser number of breaks, and besides, it can be taken down and used in other places. It is usually necessary to junk copper wire when taken down, for as a rule it will not stand re-stringing in another location without causing much trouble from breaking, due to nicked and scratched spots."

Telephone companies are using copper-clad wire, especially No. 17 B. & S. gauge twisted pair insulated wire, to displace No. 14 B. & S. gauge copper, effecting a saving of over $50 per mile, due to lessened weight of rubber and braid required for insulating the smaller wire and the use of one-half the weight of metal of lower cost than copper.

An investigation instigated by the American Telephone & Telegraph Company has afforded some valuable data as to the comparative mechanical electrical properties of No. 14 B. & S. copper wire and No. 17 B. & S. copper-clad wire. Some of this information will be found in the following tables:

COMPARATIVE MECHANICAL AND ELECTRICAL PROPERTIES.

Notation.	No. 14 B. & S. Copper Twisted Pair.	No. 17 B & S. Copper-clad Twisted Pair.
Diameter of bare wire..	.064 inch	.04526 inch
Diameter over braid....	.196 inch	.15526 inch
Thickness of insulation (rubber)	.046 inch	.035 inch
Thickness of braid	.020 inch	.020 inch
Area of bare wire	4096 cir mills.	2025 cir mills.
Area of bare wire	.003216 sq. in.	.001616 sq. in.
Area of insulation (rubber)	.01514 sq. in.	.00877 sq. in.
Area of braid	.01154 sq. in.	.008576 sq. in.
Area of cross-section, one wire	.03017 sq. in.	.018869 sq. in.
Breaking weight, single wire	190 lbs.	190 lbs.
Breaking weight, twisted wire	380 lbs.	380 lbs.
Weight per 1000 ft., single bare wire	12.4 lbs..	5.5 lbs.
Weight per mile, single bare wire	65 lbs.	29 lbs.
Weight per ft., twisted wire	.07428 lbs.	.03805 lbs.
Weight per 1000 ft., twisted pair.....	74.28 lbs.	38.05 lbs.
Weight per mile, twisted pair	392.198 lbs.	200.904 lbs.
Resistance per 1000 ft. (60 deg. F.).....	2.485 ohms.	16.760 ohms.
Insulation resistance per mile (60 deg. F.)....	500 megohms.	250 megohms.
Dielectric strength of insulation	1500 volts	1000 volts

Span in feet.....	100		200		300	
Sag in inches.....	18		42		60	
Kind of wire.....No.	14	No. 17	No. 14	No. 17	No. 14	No. 17
Safty factor, normal.	6.00	12.30	3.40	6.90	2.20	4.46
Safty, factor, loaded wire*	3.19	5.20	1.82	3.22	1.16	1.86
Per cent reduction of safety factor	47	57	46	53	47	58

SAFETY FACTORS.

I understand that it is considered good practice by signal engineers to use No. 10 B. & S. gauge copper for overhead construction, either bare or in double or triple braid, while in five and seven pair cable No. 14 B. & S. gauge copper is considered the standard of practice. It would thus appear that the conductivity of No. 14 B. & S. gauge copper satisfies the electrical requirements while the tensile strength of a No. 10 B. & S. wire is desired. In other words, the erection of No. 10 B. & S. copper lines in overhead construction necessitates the use of 32 pounds of copper for each 1,000 feet to secure required tensile strength. At present prices the copper for such a line costs $8.77 per 1,000 feet. Consider a No. 11 B. & S., 50 per cent conductivity, (Grade "C") copper clad wire to displace the No. 10 pure copper. The No. 11 copper-clad wire affords the required conductivity while its breaking weight is greater by 156 pounds. The weight per 1,000 feet is less by 8.7 pounds, and safety factor is greater. The cost per 1,000 feet of such a high conductivity copper-clad wire would be $6.78, showing a saving in metal cost alone of $1.99 per 1,000 feet in favor of the copper-clad wire, not to mention the other attendant advantages in cost of stringing such a lighter, stronger, more durable wire allowing of much longer spans.

I am inclined to think that in most instances signal engineers will prefer to use Grade "A," 30 per cent conductivity, copper-clad wire, operating with greater electrical resistance but allowing of the use of a much smaller conductor of higher tensile strength. Where possible to make such applications of copper-clad wire a No. 13 B. & S. gauge Grade "A" wire with electrical resistance at 60° F. of 6.543 ohms, and breaking weight of 488 pounds, affords a considerably greater safety factor than No. 10 B. & S. gauge copper. Such a copper-clad wire weighs but 14 pounds per 1,000 feet and costs less per pound than Grade "C" metal, so that today's prices per 1,000 feet would be $3.44, or a saving over No. 10 B. & S. gauge copper of $5.58 per 1,000 feet, or a metal cost saving over pure copper now used in open line construction of nearly 60 per cent.

I trust that this simple introduction to the first metal embodying the strength of steel with the durability of copper may help to solve some of the many problems which the signal engineers doubtless have to cope with. The material will speak for itself to such a degree that I feel that this introduction is all that is necessary.

* Load consists of a uniform coating of sleet ice ½ inch thick.
It is assumed in calculating the factor of safety for loaded wire that the wire will remain rigid and not stretch. In practice, because of the distensibility of twisted distributing wire, the factor of safety for loaded wire will be considerably increased.

The annual convention of the Nebraska Independent Telephone Asociation will be held in Lincoln, January 15, 16 and 17 at the Lindell Hotel. Nebraska sent representatives to three adjoining state conventions last year and has the promise of a good attendance from each of them in return. The association has been very successful during the past year and has advance assurance that its 1908 convention will be the best ever held by it.

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International Association Bulletin

Third Year November 20-27, 1907 No. 6

INTERNATIONAL INDEPENDENT TELEPHONE ASSOCIATION.

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629-630 Monadnock Building,
CHICAGO, ILLINOIS.

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MANFORD SAVAGE, Treasurer.....Champaign, Ill.
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G. N. BANDY.....Des Moines, Ia.
W. E. DOOLITTLE.....Lafayette, Ind.

The matter contained in this bulletin is furnished by Mr. Gary, President of the International Association.

Official Bulletin Number Six.

NEW LOCATION.

The Association is now "at home" to the Independent telephone people at its Chicago headquarters, 629-30 Monadnock Building. You may be sure of a hearty welcome if you will drop in on your next visit to the Windy City.

CONVENTION.

Plan now to attend the 1908 annual meeting January 21st, 22d and 23d at the Coliseum, Chicago. No previous engagement should prevent your presence on this important occasion. We want to make this the most successful convention to date, but to do so we must have the active co-operation of every Independent man in the field. Don't be satisfied with merely attending yourself; do a little missionary work in arousing your associates to the necessity of taking an active part. Remember, that it is *your* convention, that its deliberations may have a vital effect upon your personal interests, and that its success rests upon the individual efforts of every operator in the field. The officers of your association must have your assistance if it is to be a success. Bear this in mind, and begin at once to work and plan for a good attendance at the 1908 convention.

CONVENTION REPRESENTATIVES.

We call attention again to the importance of state and provincial associations electing their delegates and alternates to the convention without delay and reporting same promptly to this office.

PROGRAM AND COMMITTEES.

Most of the officers of the various associations have already responded to our request for program suggestions and names of members for convention committees. The others should do so immediately. Suggestions will also be welcome from anyone in the field regarding subjects for papers and discussions, as well as special features. Give us the benefit of your ideas.

CONVENTION ADVERTISING.

Telephone manufacturers, supply dealers and others, who have been asked to co-operate in a plan for advertising the convention and who have not yet responded, are requested to let us hear from them without delay. It is only a short time until the convention, and the greatest possible amount of publicity is necessary.

EXHIBIT SPACE.

The Electrical Trades Exposition Company requests us to announce that while it has already signed up many contracts for exhibits, there are still a number of desirable positions untaken in the telephone section which can be secured by early applicants. For terms and prices address Mr. Homer E. Niesz, Manager, 1006 Monadnock Building, Chicago.

SPECIAL NOTICE TO OPERATORS.

The association furnishes all Independent telephone manufacturing or supply companies with trade mark equipment "shield" stamps in denominations of 1c, for use on instruments, and 25c and 50c for switchboard sections, the latter to be applied at the rate of 1c for each drop. These stamps on the equipment you purchase are evidence that your dealer is contributing to the support of your association.

TO DISTRICT AND STATE ASSOCIATIONS.

There are undoubtedly quite a number of Independent operating companies in the organized states which are not yet members of their respective district associations. The officers and members of such associations should devote their energies to bringing in these non-member companies, for the good of such company and with a view of strengthening the state organization. A little personal effort on the part of the officers and members will accomplish results of lasting benefit along this line. Take the matter up at once and see how many new members can be enrolled before the convention. Work could also be done to good advantage in organizing new territory. The association will be glad to co-operate with all interested in forming new associations, by submitting detailed plans, suggestions, etc.

"SHIELD BARGAINS."

Up-to-date managers who appreciate the value of a strictly high class modern illuminated sign, one that compels public attention and secures increased business, while at the same time enhancing the appearance of an exchange, and which, for a limited time, may be secured at small cost, will do well to write for particulars regarding Colonial lanterns before our present generous offer is withdrawn.

FINANCIAL STATEMENT.

Apportionments by executive committee for 1907-1908:

Associations—		Paid to Date.
Arkansas	$100.00	.....
California	300.00	$100.00
Canada	25.00	25.00
Illinois	750.00	.....
Indiana	1,000.00	100.00
Iowa	700.00	.....
Kansas	400.00	75.00
Kentucky	200.00	.....
Maine	25.00	.....
Michigan	750.00	.....
Missouri	500.00	150.00
Nebraska	350.00	.....
New York	300.00	.....
North Carolina	25.00	.....
Ohio	1,300.00	50.00
Oregon	40.00	.....
Pennsylvania	500.00	.....
Texas	100.00	50.00
Vermont and New Hampshire	25.00	.....
Virginia	50.00	.....
Wisconsin	250.00	.....
West Virginia	250.00	.....
Totals	$7,940.00	$550.00
Contributions and pledges of switchboard and telephone manufacturers; trade mark equipment stamps.	$6,500.00	$360.00
Supply dealers and jobbers	5,000.00	.....
Engineers	250.00	.....
Journals	250.00	.....
Operating companies	750.00	240.00
Special	4,000.00	3,000.00
Totals	$16,750.00	$3,600.00
General, honorary membership fees..	$750.00	$50.00
Merchandise accounts	319.74	.....
Total	$1,069.74	
Total		$25,759.74
Paid in		4,200.00
Balance to be collected....		$21,559.74

FISCAL YEAR 1906-7, CLOSED MAY 25.

Total receipts this year to date, including special committee balance		$17,940.80
Total expenditures, including accounts accrued before last convention		14,884.94
Balance on hand		$3,055.86
Accounts payable	$ 443.47	
Estimated expense for next thirty days	1,753.25	
		2,196.72
Surplus, November 21st		$859.14

Annual assessment 1c per unit. A unit is an operating telephone or a circuit mile of toll line. Assessments are payable monthly, and are based on number of units in respective associations at last convention.

While the present financial stringency may make it difficult for a time to secure money needed for extensions and development of new territory, it should be remembered that the Independent telephone movement had its beginning at the most acute period of one of the worst panics this country ever experienced.

Starting under the most unauspicious circumstances, the Independent companies have grown from nothing to over 3,000,000; more than ten times the number in use at the close of the first seventeen years of the old company existence. In Ohio alone, the Independent companies operate as many telephones as there were in the entire United States when they entered the field, with their securities distributed among thirty thousand stockholders. Conditions

similar to those in Ohio prevail in a numbor of states.

To the Independent companies belong the credit for the extension of the telephone to the rural districts. It is principally to their efforts, too, that the country owes its long distance development. For, while their competitors may have longer through lines, the Independents are indisputably in the lead with short haul lines, and it is over these lines that more than ninety per cent of the long distance business of the country is transacted.

The Independent companies have built up a business that is the marvel of this progressive ago. The first few years of Independent development were under the most unfavorable financial conditions; while today they are successfully operating competing systems in all the important cities of the country, with the exception of five or six. Strange as it may seem, the introduction of a competing company, instead of driving its predecessor from the field, has in most cases, been the signal for development, the Independent company keeping steadily abreast of such development and often surpassing it.

In some cases the Independent movement had its origin in a just sentiment against monopoly and commercial oppression, but it is today conducted along purely commercial lines and there is no good reason for a conflict between the two systems beyond ordinary competition for business, with a constantly growing demand for telephone service, which both systems, work as they may, have never been able to supply.

The Independent companies were handicapped at the start by lack of skilled men and efficient manufacturing facilities, but this condition has changed. Today their forces include the best engineers and most successful business managers, and there are more than fifteen large exclusive manufacturing concerns, and probably fifty smaller ones turning out equipment for Independent companies that is equal, and in some cases superior, to that used by their competitor. Recently the Western Electric Company, the principal manufacturing concern for the Independent's competitor, entered the open market and is now offering its product to all who may care to purchase. While the Independents have neither the need nor inclination to buy such equipment, this latest move may be regarded as a recognition of the strength and stability of the Independent telephone movement.

With such a demand for the commodity furnished by Independent telephone companies, insuring their permanency in the commercial world, and in view of the fact that these companies have developed and prospered in spite of very perverse conditions and are now demonstrating that the earnings of telephone companies are not adversely affected during periods of business depression, it must be apparent to the careful investigator that the securities of Independent telephone companies offer a safe form of investment even in the dullest times.

Independent operators everywhere should present these two points to the notice of their bankers, bond and stockholders and prospective investors, for the purpose of maintaining and strengthening the confidence in Independent telephone securities which they deserve, viz: *That the Independent telephone movement was started in the panic of 1893, and that the old company now offers to sell apparatus to the Independents, for the first time in the history of the business.*

THEODORE GARY, *President.*

Publicity Department.

Expansion of Telephone Business Requires Increase in Capital.

The growth of a telephone business necessarily implies an increase of plant and investment. The growth has been so rapid that funds could not be supplied from the net earnings. The necessary increase of investment has had a tendency to disturb, since some telephone plants financed at one period soon find it necessary to refinance in order to take care of immediate needs, the result of rapid growth. Rapid expansion is generally considered a point in favor of a business, but growth of the telephone business has had a more or less depressing effect on investors.

Advantage of Telephone Securities.

One advantage telephone securities have over other public utility securities is that the telephone requires a less investment per capita than any other public utility, therefore the interest charge necessary to serve a community is less, while the earnings from the telephone are more uniform, yet as sure and safe as income from water, gas, electric light or street railways, since it has been demonstrated that the earnings of the telephone are less affected by the seasons and unfavorable crop or financial conditions than any other business. The growth of the telephone business has been steady for thirty years, and will not let up until every dwelling and business house is supplied with one or more telephones. Until such a development has been attained, there can be no let up in the expansion.

Necessary Provisions for the Future Growth of the Telephone Business.

Perhaps the most important feature in connection with the telephone business, and one which has been a stumbling block in taking care of the financial end is making provision for future growth, since it is well known by the experienced man who finances and operates telephone plants that there will be growth from time to time—growth too large to be taken care of out of net earnings. Provision must contemplate that securities can be drawn from time to time, under proper conditions and restrictions, that will safeguard the securities already issued, and to supply the needed, added capital. To illustrate: "A" wishes to bond a telephone plant for $50,000 in a city where experience has taught will finally require an additional investment of $100,000. These bonds may be issued for a term of twenty years, being provided in a mortgage authorizing and securing $150,000 bonds: $50,000 of which is to be issued and the proceeds used in connection with the first construction. The unissued bonds are deposited with a trustee. The mortgage provides that additional bonds may be drawn from time to time to reimburse the company to the extent of, say, ninety per cent for money actually expended for extensions and permanent additions to the plant. The experienced operator knows that provisions authorizing additional bonds to be issued must be preserved to insure the safety of the investment.

Facts Too True.

The growth of the telephone business carries with it increased cost per station for installing and increased cost per station for operation—statements almost inexplainable to the average man. Investors not understanding that there is such an increase, have had suspicions that much of the new capital provided ostensibly for extensions, has gone for replacements. That the larger plant costs more per station, both to install and operate, has misled inexperienced men and naturally left the inference that there is no profit in the business.

A Fool-Proof Business.

When a business has demonstrated its ability to thrive and live through the development stage, it certainly ought to be considered a good basis of security. That the telephone business cannot be permanently injured by incompetent local management or temporary poor service has been shown time and again. And almost every plant has passed the one man period.

Facts on Duplication.

The directories of thirty cities with competition show that the duplications are less than eleven per cent, and that two telephones are not an absolute necessity unless subscribers wish to reach every one that has a telephone.

In St. Louis, prior to competition, there were about 12,000 telephones—a development of twenty years. Five years later, with competition, the Bell claims to have 40,000 and the Kinloch 30,000 telephones. In that city the directories show duplications of about thirteen per cent. Therefore, it is plain that both telephones are not required unless the subscriber wishes to be in communication with all the telephones in St. Louis, since he can have many more connections with a larger percentage of the whole population in either system than he originally had.

The same condition is true in Kansas City. Five years ago, before competition, the Bell had about 9,000 subscribers. At this time each company has 19,000 subscribers. Since competition entered the field has been developed very rapidly and the percentage of telephones in use in each system, in proportion to the population, is greater than when there was no competition. Duplications in Kansas City are also about thirteen per cent, and here, too, no one could say that it was necessary to have two telephones, provided they were satisfied with the limited service of one system.

Competition in the Telephone Business No Drawback to It or to the General Public.

A factor in any business is competition. Competition in the telephone business has not proven a draw-back and does not endanger the existence of either of the opposing properties. There is more business in the country today than the combined interest of the forty-five Bell companies, the ten thousand Independent companies, and hundreds of mutuals can take care of, and the experience of more than fifty of the principal cities and towns has demonstrated that two systems can be profitably maintained to a great advantage to all concerned.

Telephone competition is always limited to two systems, and there can never be general competition.

Before the advent of the Independents it was thought that the telephone was a natural monopoly, but experience has proven the contrary.

There are more Independent telephones today than there are Bell, by a million.

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The Independents are organized into a system, the ownership resting with local people and thousands of local stockholders, while the Bell is financed principally in the large centers and is handled in the east. Each draw from entirely different fields for funds. The Independent companies have had a decided advantage over the Bell on account of local financial influence. There is a place for two telephones in almost every community of 10,000 population and up, occupied by a Bell company, because it generally fails to develop a territory.

Competition is desirable unless there is a development by one company of one telephone to five or six persons in the community. With full development there is very little room or demand for competition.

Plenty of Good Apparatus Available for the Telephone Business.

In judging a telephone security, permanency and efficiency of equipment must be taken into account. The telephone business of today is handled with one of three systems; the magnetic system, or mechanical signaling; the common battery system, in which the receiver is simply removed from the hook which signals central; the automatic, which does away with the necessity of operators. In this system the subscriber manipulates his own connection.

There is a fourth system just being perfected, where the ordinary central energy telephone is used, and the operator at the central office takes the number in the usual way, then manipulates keys, very much like an adding machine which puts in motion an automatic system in every essential. With this system it is claimed that one operator is able to take care of many more lines than with the manual systems.

These four systems are all good and will be used permanently. The magneto is best for the small exchange. It will stand more punishment, requires less skill to operate than either one of the other systems, and therefore is particularly desirable for exchanges ranging up to 1,200 to 1,500. Above that number either of the other systems are best.

The Independents have half a dozen or more manufacturing companies building equal or superior equipment to that used by its competitor.

Things to Consider in Estimating Cost of a Telephone Plant.

In figuring the value and cost of a telephone plant, the cost is much more than the visible physical plant, since cost necessarily includes putting the business on the books, to use an insurance term. About thirty per cent more telephones must have been installed and taken out and reinstalled before an average has been attained. A telephone plant is much like a large bridge. Before the bridge can be swung, heavy false work must be erected. After the bridge is completed, the false work is removed and the completed structure remains, but all know that the cost of the bridge proper carries the cost of making the bargain and erecting and removing the false work. So it is with a telephone plant, the cost is more than can be seen.

Truths Investors in Telephone Stocks and Bonds Should be Made Acquainted With.

When estimating the value of telephone securities, due allowances should be made for the increased cost per telephone with the size of the exchange. This sometimes causes doubt as to the real value back of securities, especially if the cost of a telephone plant is known, say with knowledge of the cost of a plant of 500 lines, which would probably be between $25,000 and $30,000, one would naturally conclude that a telephone plant with 1,500 subscribers could be built and put in operation for three times what a 500 line system costs. While this is logical reasoning, the real facts are that the cost would be increased from $30 to $40 per station and instead of a 1,500 plant costing $90,000, it will cost nearer $150,000, while a plant with 10,000 telephones will cost upwards of $2,000,000, or more than $200 per station to install.

Again, it might be known that a plant with 500 subscribers is earning $10,000 a year gross, and $5,000 net. One would logically reason that by increasing the plant and investment three times, say to $90,000, the gross income would be $30,000, and the net income $15,000, but experience has fully demonstrated that a telephone plant cannot be increased from 500 to 1,500 telephones by trebling the investment, nor will a plant with 500 telephones that is earning $10,000 gross or $5,000 net, yield $30,000 gross or $15,000 net by increasing the number to 1,500 telephones.

Good Management Overcomes all the Mistakes in the Telephone Business.

A great factor in the telephone business in the past has been the displacement of equipment, not because it had become obsolete or incapable of being operated, but on account of the plans not being laid out on broad enough lines. Plants that were originally laid out and built for 500 telephones, now have 3,000 telephones. The equipment and wire plant was planned for 500 telephones and could not be increased to take care of the growth by adding to the old plant and it was necessary that entirely new apparatus be installed, and larger and heavier pole lines provided. This has been the experience of hundreds of companies started years ago.

Find the Cost of Telephone Service.

The question of probable profit enters into every proposition. The telephone is no exception. It is just as possible to sell telephone service at less than cost as it is merchandise, manufactured goods, or wheat. Therefore, find the cost and charge accordingly.

Effect of Stock Bonuses on Investors and Bankers.

Some companies have given away stock bonuses at the beginning of their business and as a consequence investors have been shy when considering bonds and full paid stocks in the same companies. When this condition is found it should be no grounds for alarm, unless you are asked to consider such stock as a basis of credit.

And then, it might be true, that it is proper and reasonable to issue stock as compensation to those originating, executing, financing and finding a place to build up a telephone business. That such stock issues may be legitimately paid up as if actually paid in lawful money, is a well recognized fact. At first such issues may have only speculative value, since the value must be made. Such stock is issued in anticipation of the icreased value of a property and in payment of the legal and special services rendered, however, and it generally carries the equity in a property and quite frequently every share of it is worth par or more.

Such stock issues should be just as legitimate and sound as in cases where a bank with $50,000 capital is earning thirty per cent and paying its stockholders ten per cent dividends, setting aside twenty per cent to surplus fund. At the end of five years the surplus fund equals the capital stock and if such bank should issue $50,000 stock in lieu of the surplus, would anybody say that such stock was watered or that it was unsound and the bank unworthy of confidence? Any telephone company might make its stock good by a similar process. The facts in such a case must be considered, since the presence of such an issue does not necessarily imply no real value at a later period.

Points to be Remembered in Judging Telephone Securities.

The vital question to be considered in estimating telephone securities are those in connection with the plant itself. Is the field good; the personnel of the company right; rates adequate? Are provisions made for taking care of the future growth? Is the plant well built, physically? Is the depreciation being taken care of by present expenditures and a reserve fund provided for future extensions? Is the earning sufficient to make the business permanently profitable?

Stability of the Telephone Business.

If there is even a remote question in anyone's mind regarding the stability of the telephone business, let him consult his monthly telephone bill, and try to figure out when his telephone service is to be discontinued.

Prospect for Increased Business.

For thirty years the demand for telephone service has exceeded the supply. All the companies in the field today cannot fill the demand. There are towns of 4,000 population in this country with more than 1,000 telephones in use in one system, or one telephone for every four persons in the town. A thirty years' experience ought to be a good guide. We now have eighty million people and six million telephones. We should have twenty million telephones right now. This should settle the prospect of increased business.

Telephone Apparatus.

Abundance of efficient apparatus can be had from more than thirty different Independent manufacturers. The Bell subsidiary manufacturing companies offer to sell anyone the same apparatus it uses. There seems to be no possible danger that the industry will not thrive for want of apparatus.

Danger of New Invention to Endanger Present Telephone Systems.

No great changes have been made in either the magneto or central energy systems in the past five years. During that time the automatic telephone has been perfected, and all systems are in use and will undoubtedly continue. No wireless telephony can ever be made a commercial success, is the opinion of no less an authority than Edison. So in judging the value of telephone securities this feature can be safely passed.

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Southern Ohio Affairs.

Cincinnati is always a ripe topic. There has been something doing in a telephone way ever since competition invaded the industry. Whatever may develop in the future, the Fitzsimmons Telephone Company, by its persistence alone, should be amply rewarded in sentiment and substance.

This company is eternally kicking over the pins of the Bell concern. It has held a franchise to operate a telephone system in Cincinnati since 1896 and the permit will endure till 1921. The company is capitalized at $5,000. Its franchise is held by virtue of a probate court decree numbered 5,840. According to Mr. A. F. Otte, this company has a system now comprising some 1,200 miles of wire and 2,500 instruments. The installation covers every portion of the city, if the records of the city electrician can be relied upon.

Mr. Harry Burckhardt usually represents the Fitzsimmons company when there is anything telephonic agitating the city council, and that is quite frequent. During August and September there was a general outpouring of editorial sentiment in the local papers. It was contended that the city's loss of business was inestimable because Ohio was cut off by its network of Independent wires.

The public appeared to awake, temporarily, from a lethargy of indifference. The suburbanite was especially aroused, and in one instance the Millcreek Valley Business Men's Club issued a bulletin containing what follows:

Economic facilities for acquiring money are sought after on every hand, and in no other way are we so much hampered as by monopolies, the worst of which are public utility monopolies entrenched behind city law-makers and executors who stand for such combinations by exerting an influence in city and valley councils and in the election of unjust, corruptible and corrupt grafters to office, who are the finishing wheels in the combinations, constantly seeking class privileges to defeat justice; enrich themselves and impoverish the people who pay the taxes and those who furnish the genius, brain and brawn of production.

In no locality in Ohio is this condition of affairs so keenly felt as in the Millcreek Valley villages.

For years we have supplicated, petitioned and exposed the wrongs done us by corporations, hoping to have the heavy burden they have imposed lightened by legislation or competition.

They and their political grafters stood like a wall of adamant against the slightest encroachment upon their exploiting, legalized prerogatives, wrung from the people by class legislation, bribery and a shameful system of grafting, till a natural gas company of Columbus broke the ice, pried open the closed door of monopoly-ridden Cincinnati, and stood in the fire of the inner circle long enough to give for our share of profit 30-cent gas for ten years. The Columbus company had untold millions behind them.

Now come the Independent telephone companies to the Millcreek valley, a mammoth, wealthy organization, owned by a vast body of common people, and spread all over the United States, except in New Orleans and Cincinnati, in which cities the Bell company holds a monopoly, but under such pressure from the clamor of the people for competition that the company's holdings in these two cities may well be compared to a bow-legged man astride a greased hog, trying to hold it by the tail.

The Independent companies have gone all over the states, establishing telephone systems, and when the stock was cleverly taken up by the people, they would hitch up with other similar systems and by establishing connections across the states and the continent they became enmeshed with and a lasting part of the great national people's telephonic movement, and now hold a position in the telephone field that will in time drive monopoly in it from the face of the earth.

In many counties in Indiana and Ohio the Bell company is not represented, and in many it is in a hopeless minority and wants to sell out to the Independent people, because the Bell as a monopoly is refused connections with the Independents through so many counties in the central states that in them the Bell company has ceased to be a factor in telephony.

The Independent company proposes to give us a thorough, up-to-date county system in which the Valley people can have a better service than the Bell company has given us and at a uniform reduced rate.

There will be no ten-cent rates, and telephones will be placed where desired through the territory. Do not be fooled by the old stereotyped whine of monopoly (going to the wall as it is, because of the stern, persistent demand of the people for justice, in service and prices, as justice has been taught in the telephone business all over the country outside of Cincinnati and New Orleans).

Under the proposed terms of the Fitzsimmons or Independent company, there can be no logical objections to giving a franchise, and no person need or will patronize this company unless proper inducements are given to do so.

The Independent companies have installed as many telephones in Ohio alone, since 1895, as the Bell company had in operation in the entire United States after the expiration of eighteen years of monopoly under patented protection.

Is there such a thing as excusable bad service, except when produced by the action of the elements over which we have no control?

The following resolutions favoring the Independent telephone company were passed by the Millcreek Valley Business Men's Club, July 26:

Whereas, For many years the people of Millcreek Valley, against their earnest protest, have paid tribute to the Bell telephone monopoly, backed as it now is by certain political powers, who now, as in the past, in the government of Cincinnati, hold up the people of Hamilton county to be systematically exploited beyond all reason, by the acts of the powers, henchmen, who are peculiar persons in the city council, who, however honest they may be in their private transactions, are notoriously unjust in their legislation to maintain monopoly, by preventing telephone competition; and,

Whereas, The Independent telephone companies, now controlling a large majority of the telephones in Ohio and other central states, have gained a franchise in Cincinnati, and desire to furnish a county system that will give better service at reduced rates than the Bell company does, if given franchises by the Valley villages for an outlet to their central and northern Ohio connections, which will bring us into intimate telephonic touch with the vast volume of business of Ohio, now denied us by the Bell company because of its lack of facilities to do business, therefore be it

Resolved, That the Millcreek Valley Business Men's Club earnestly recommends that the village councils of the Valley grant the Fitzsimmons companies franchises—because:

1. The resulting competition will improve the service and lower the price.
2. A proper indemnity bond will be furnished; and
3. The Fitzsimmons company has proven its honorable standing and fidelity toward the Valley people by sanctioning to be placed in the Elmwood Place franchise the famous section of the Boston (Mass.) franchise, which was introduced to the club by the company's agents, and reads, to-wit:

"Section 8A. This franchise is granted upon condition that the Fitzsimmons company, its successors or assigns, shall never directly or indirectly sell, assign, convey or lease its franchise to, nor combine or merge with the Cincinnati, City and Suburban Bell Telephone Company, the American Telephone & Telegraph Company, under penalty of the forfeiture of all rights hereunder and all the plants and other property of Fitzsimmons company, its successors or assigns, then installed in the Village of Elmwood Place; and Fitzsimmons company shall not at any time enter into any combination, directly or indirectly, with any person, persons, or corporations, concerning the rates to be charged for telephone service in the village of Elmwood Place, and no officers or employes shall at the same time be in charge of officers or employes or managers of any other telephone system being operated in said village; provided, however, that nothing shall be held to limit or abridge the right of Fitzsimmons company, its successors or assigns, to make contracts with telephone systems or exchanges outside the village of Elmwood Place, for interchange of business and division of earnings, from their connecting lines."

At a meeting of the fifth district, Ohio Independent Telephone Asociation, held at Hamilton recently, President Beam is quoted as having said:

Independent telephone interests are operating more telephones in the state of Ohio today than the entire number of telephones in the United States in 1895 and they now have in service more than twice the number of telephones operated by the opposition. It is conservatively estimated that there are now over $35,000,000 capital invested in the state of Ohio, representing over 30,000 stockholders, and that Cincinnati is losing thousands of dollars because of lack of Independent connections with this and other states.

Independent telephone men are awake to the advantages of competition and none are more so than the concern which is now actively striving to awake an interest among the citizens of Cincinnati.

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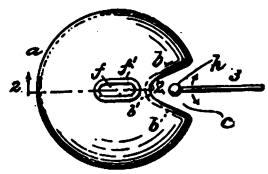
Recent Telephone Patents

By David S. Hulfish

869,252. Pole. Hezekiah Miller, Fort Morgan, Colo. Filed July, 1907. The claims cover details for anchoring a metallic pole in a concrete foundation.

869,368. Attachment. Ross Higgins, Canfield, Ohio. Filed February, 1907. An adjustable support for telephone receiver on a telephone set, with means for holding the switch-hook down when desired.

869,382. Safety Device. William F. Newton, Spokane, Washington. Filed April, 1907. A pole embracing belt having hand grips and means for attaching to the belt of the climber.



869,885.

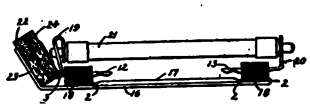
869,449 and 869,450. Meter System. J. L. McQuarrie, assignor to Western Electric Co. Filed February, 1906. A system having meters at the central office. Party lines have an answering jack and a line signal per station, and the meters are associated with the respective answering jacks.

869,554, 869,864 and 870,495. Testing Devices. Frank B. Cook, Chicago. Filed, March, 1906. Testing and resetting devices for testing self-soldering heat coils without removing them from the protector, comprising means for applying current to the heat coil and for operating it when heated, and for resetting the protector when the testing device is removed.

869,885. Signal Gong. George F. Drew, Brunswick, Maine. Filed October, 1906. A new design of gong suitable for telephone ringers. (See cut.)

869,973. Attachment. William B. Lehmkuhl, Cambridge, Mass. Filed May, 1906. A device for suspending a portable set upon a desk.

870,002. Cable Hanger. Malcolm C. Williams, Kansas City, Mo. Filed October, 1906. A marlin loop has its messenger clip



870,530.

formed specially to retain the messenger and to give a spring support to the marlin loop and cable.

870,168. Intercommunicating Telephone. William W. Henry, Wollaston, Mass., assignor to Samuel H. Couch, Boston, Mass. Filed September, 1906. A telephone set is provided with a plurality of line-selecting levers, the operation of any one of which closes the talking circuit and then the ringing circuit for ringing the called station. The lever operated then locks to maintain the talking circuit.

870,338. Coin Device. Edward A. Beaumont, Jr., and George W. Garmon, Philadelphia, Pa. Filed February, 1906. An audible signal coin collector in which an ejector is provided for coins which may stick in the carrier.

870,530. Protector. Frank B. Cook, Chicago. Filed January, 1906. A compact protector unit comprising a ribbed sheet metal base with a fuse and carbon arrestor mounted thereon (See cut.)

870,551. Central Energy System. F. W. Dunbar, assignor to Kellogg S. & S. Co., Chicago. Filed December, 1900. In a common battery cord pair, a differential supervisory relay is used.

870,574. Composite. Charles W. McDaniel, Kansas City, Mo. Filed April, 1906. In a local fire alarm circuit, a relay is provided for transmitting the alarm to central office over the telephone circuit. (See cut.)

870,634. Call Box. Frank A. Lundquist, Chicago. Filed May, 1906. In a calling device similar to the Strowger, the dial is fixed and a lever is drawn down to pass through a notch corresponding to the digit to be called.

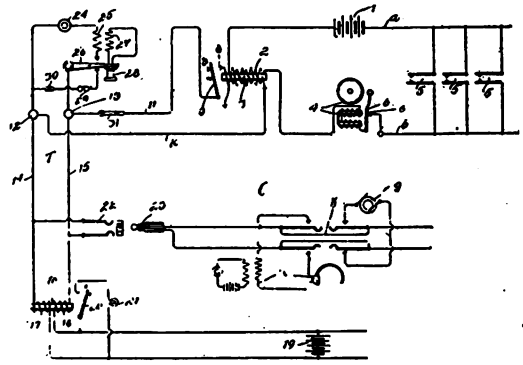
870,714. Heat Coil. Frank B. Cook, Chicago. Filed February, 1907. In a separable heat coil, a coiled spring unites the two parts electrically and maintains the circuit after the operation of the coil.

871,042. Signaling Circuit. S. A. Norstrom, assignor to C. L. Redfield, Chicago. Filed July, 1905. An automatic device is provided for depolarizing a signaling magnet immediately after the cessation of the signaling current.

871,043. Party-Line System. S. A. Norstrom, assignor to C. L. Redfield, Chicago. Filed August, 1905. A polarized, step-by-step party line selecting system, using ratchet at the substation.

871,092. Automatic System. Frank A. Lundquist, Chicago. Filed August, 1903. A substation telephone set equipped with calling devices for operating an automatic exchange.

871,468. Mouthpiece. Anna Bebout, St. Louis, Mo. Filed January, 1907. A portable mouthpiece for attachment to any transmitter. The object is to prevent infection from public mouthpieces.



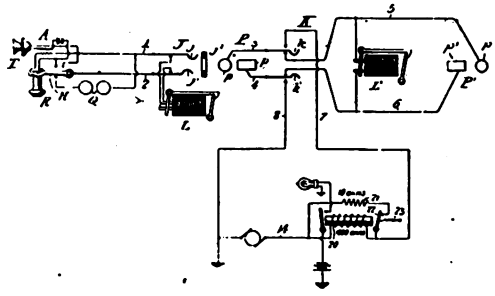
870,574.

871,470. Receiver. Hiram E. Booth, Salt Lake City, Utah. Filed September, 1902. An auxiliary diaphragm is provided between the receiver diaphragm and the ear of the listener, to modify the sound received.

871,485. Set. W. W. Dean, assignor to Kellogg S. & S. Co,. Chicago. Filed June, 1903. All parts are rigidly mounted upon the backboard and when the writing shelf is removed all parts are fully accessible.

871,490. Insulator. John D. E. Duncan, New York, N. Y. Filed January, 1907. The insulator pin is attached to the cross-arm by a U-bolt passing through the arm, the pin resting in a saddle upon the side of the arm.

871,519. Party-Line System. S. A. Norstrom, assignor to Casper L. Redfield, Chicago. Filed July, 1905. A lockout, selective, party-line system. Step-by-step selection is provided for the selection of stations, with such details as permit the ringing of any two stations simultanously.



872,171.

871,535. Tip. Frederick B. Thatcher, Providence, R. I. Filed January, 1907. A cord tip having a loop of wire to hook over the binding post or terminal.

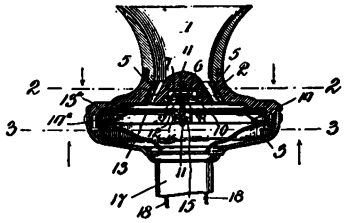
871,737. Transmitter. Elias E. Ries, New York, N. Y. Filed June, 1900. In a variable resistance transmitter, a small quantity of conducting fluid is placed between two surfaces, one of which moves with the diaphragm, and the cross-section of the fluid is changed with the movement of the diaphragm.

872,171. Protector. W. W. Dean, assignor to Dean Electric

Co., Elyria, Ohio. Filed April 7, 1906. A device for protecting ringing machines from short circuit. A high resistance relay in the ringing lead is normally shunted by a low-resistance shunt, but with current above a critical value the relay removed the shunt and the full resistance of the relay is left in the ringing lead, cutting down the current. (See cut.)

872,204. Fumigating Apparatus. Louis I. Shrader, New Albany, Indiana. Filed May, 1907. A box-like device for applying disinfectants or germicides to transmitter and receiver.

872,216. Insulator. Homer D. Bodley, Stanley, New York.



872,284.

Filed February, 1907. A groove in the insulator received the wire and a pivoted clamp retains it.

872,284. Transmitter. Rasmus Hansen, Chicago. Filed December, 1902. A transmitter having a reversed resistance button. The front electrode is rigid, the diaphragm being attached to the rear electrode. (See cut.)

872,293. Ringing Circuit. W. W. Dean, assignor to Dean Electric Co., Elyria, Ohio. Filed January, 1906. Improved means for automatically ringing the called station until the call is answered.

Northwestern Pennsylvania Association.

There are a considerable number of small Independent operating companies in northwestern Pennsylvania that are not members of the Pennsylvania Independent Telephone Association, and for various reasons would not become affiliated with the state association.

They are more particularly concerned with local affairs, and, while in full harmony with the things advocated by the larger body, felt the need of a restricted organization. These companies are now brought together as the Northwestern Pennsylvania Telephone Association.

The meeting was held at the offices of the Petroleum Telephone Company, Oil City, November 20. Representatives from a number of companies were present, including Messrs. W. T. McDonald, T. L. Anderson, Harry Hamilton, H. R. Shawkey, A. P. Addleman, L. D. Corey, D. K. Mitchell, J. D. Fry, J. W. Knapp, D. W. Moore, W. S. Paca, J. H. Longstreet, Geo. E. Bower, W. W. Shawkey, J. W. Wright and D. K. Cottle. The attendance represented a total of 7,723 instruments.

The temporary organization was made permanent by electing W. S. Paca, president; L. D. Corey, secretary, and J. H. Longstreet, treasurer. The officers were instructed to draft a constitution and by-laws for the association.

It was the wish of the membership to have meetings at least quarterly for the interchange of ideas for mutual betterment. Nearly all the members present addressed the meeting, the expressions covering a wide range of subjects.

Berlin Telephone Service Meter.

A telephone metering appliance which is believed to have solved the problem of providing a mechanism to register telephone calls at the subscriber's telephone has been perfected in Berlin.

The apparatus is a simple mechanism contained within the box holding the telephone transmitter. This box displays in one corner of its exterior a small indicator registering the number of calls or connections made. Two forms of the appliance have been perfected. One form counts all the calls made, whether or not the subscriber gets the connection asked for. Instruments of this kind are designed to be used where cheap service is to be furnished under an arrangement whereby a fixed percentage of recorded calls shall be considered non-productive and shall not be charged for. This percentage is based on the estimated proportion of non-productive calls to the number of total calls made.

The subscriber using this appliance, when he wishes to make a call, pushes a button below the indicator. This attracts the attention of the operator and at the same time causes the indicator to count one, much as a street car registering dial records the fares as they are rung up.

The device which records only when a connection is made is slightly more complex. The subscriber calls by pushing a button. This does not directly affect the indicator, which remains locked in such a position that the operator, if she secures the desired number, can complete the connection, causing the dial to register; or, failing to get the desired number, she can release the button, which returns to its normal position. Thus the dial always displays the number of connections established since the last regular inspection by the company's agents.

Telegraph and Telephone Extensions.

The Imperial Chinese telegraph administration has established offices throughout Manchuria. New lines have been constructed since the war, and although some opposition was offered by the Japanese military authorities to their crossing the line of the South Manchurian Railway this difficulty has been overcome. Wires formerly controlled by the Russians have, moreover, been transferred to Chinese hands, and the service, therefore, is now operating in all centers of importance except Antung. All offices accept English messages. They are as follows: *Shengking Province:* Chinchou, Changtu, Fakumen, Yichou, Kungchuling, Yingkou (Newchwang), Mukden, Hsinmintun, Tieling, Tungchiangtzu. *Kirin Province:* Changchun (Kwanchengtze), Hunchun, Yitungchou, Kirin, Ninguta, Petuna, Harbin. *Heilungchiang Province:* Aigun, Mergen, Helampo, Tsitsihar.

At Mukden there are two telephone services, the public exchange operated by Japanese and the Chinese official line connecting the various yamens, police offices, and government bureaus. The two systems are connected. The Japanese have a long-distance service along the railway lines from Dalny to Mengchiatun, with a branch to Newchwang, and a second between Mukden and Antung. Instruments are also in use at Liaoyang, Tieling, Antung, and Tatungkou, having in all these places been originally installed by the Japanese military authorities. The Chinese, however, have appreciated the advantage of this method of communication and propose to control their own lines and to install systems in Kirin and Kwanchengtze.

Time of Allowance for Patents.

As most inventors know, it has hitherto been the practice of the United States patent office to issue patents on inventions three weeks after the date of allowance on payment of the final government fee. The commissioner of patents has given instructions that hereafter the period between the date of allowance and the issue of the patent shall be four weeks.

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Telephone Line Troubles

By C. L. Patee.

TROUBLE in all of its phases has ever had a fascination for me. In one respect trouble is like poverty, in that there is always to be a little of it around.

The aim of every manager, and the same may be said of every one who actually repairs the trouble, should be to have as little of it as possible.

Keep your plant in such shape that the same trouble for the same line will not recur. Most subscribers will put up with one case of trouble, especially if the inspector is courteous and obliging. I have found that most subscribers like to be told what the trouble was and how it occurred, even though they do not understand about it after being told. However, there are exceptions to this rule. One of my subscribers, for example, a person of much importance in her own estimation, at least, kept calling repeatedly, but when the operator would answer she would get no reply. This continued until the chief operator called my attention to it. Knowing the trouble and the subscriber as well, I went immediately to the house to be met at the door by the subscriber, whose ire was disconcerting to say the least. Nothing daunted, I proceeded to show the battery wire which she had broken. But to convince her was the next thing. I tried most of the ways which experience has taught, but the only thing I could get her to say was, "You don't need to show me anything. Me and my daughter know just what the trouble was, and unless you discharge that nasty operator you can take our telephone out."

Only a comparatively few subscribers will put up with a repetition of the trouble the next day, or a few days later, and when the same thing occurs a third time, look out for the fireworks.

I have acted as inspector for several companies, from just common trouble-man to special inspector on all kinds of plants with the exception of the automatic. I believe that every manager can better serve the company for which he works if he has had some similar experience, especially in smaller exchanges where we do not have a trouble clerk and wire chief.

The troubles to which overhead bare wires are subject are many, but I wish to speak of crosses and open circuits, believing that they are responsible for a large percentage of all trouble.

Of two inspectors sent out in different directions to clear up a short circuit, one gets back twenty or thirty minutes before the other and by doing so gets a credit mark, while the other possibly gets a reprimand, and it would seem, all things being equal, that he deserved it. This has not been my experience.

I have found that as a rule the man who takes a little time to do his work gets it up in better shape. I have not much patience with the man with the broomstick, or the one who simply climbs up and shakes a cross out, not stopping to do a little much needed trimming or to pull the slack which may have been the direct cause of the trouble. All of this takes time, but it is much better to have the work done well than to send another man the next day for the same trouble.

The best advertisement a company can have is satisfied subscribers. A few inspectors, when they are out after trouble, look for just one particular case and pay no attention to anything else which may come under their observation.

I have known of those who would walk right past a short circuit on a line, other than the one they were expected to clear, and see nothing, but I am glad to say that inspectors of that kind are becoming more scarce every day. Others make the mistake of repairing some minor trouble to the neglect of the more particular one which they were supposed to repair. I instruct my inspectors to examine very thoroughly every foot of line which they patrol, and if anything is found which is in need of repair, to repair it if possible, and if not, to take notes and report same at the office. In this way we keep in touch with our toll lines and can quite frequently locate trouble when it occurs. This would not be necessary in a large office with access to testing and measuring instruments—still I believe that notes of this kind would not come amiss even there.

One of the things which has been a great source of trouble with us is the old square transposition. This, when combined with the small boy and the ever ready stone, or the hunter with his shotgun, causes no end of trouble and expense. The transposition glass being longer makes a fine target and when a square transposition is broken the line slacks back so much so that the inspector with the ordinary combination blocks and grips cannot pull it back to its original position. This, of course, only applies to wires as large or larger than No. 10. I am glad to say that this trouble has been almost entirely eliminated since the adoption of the rolling transposition, for a broken glass in this case causes a short circuit which needs only to be tied in on a new glass to clear the trouble.

It is of vastly more importance that the trouble be prevented than is the clearing of same after it has occurred. I do not wish to convey the idea that every effort should not be put forth to clear the trouble immediately after it has been reported. No pains should be spared to prevent trouble, but right here let me emphasize that *repeated* occurrence of the same trouble is almost unpardonable.

There are various ways in which the inspector can cut down expenses. By careful testing he can quite materially reduce the item of livery hire. Extravagance by one inspector may not amount to very much, but when it is multiplied by the number of trouble men employed by any company it is an item which cannot be overlooked, for after all it is results which count and your stockholder is more interested in dividends than he is in the way those dividends are secured.

Traveling Telephones.

The *Civil and Military Gazette* reports that Lord Kitchener has accepted for use in India a form of movable telephone, which can be employed with great facility in the field. The cable weighs only seven pounds per mile, but is so well insulated that it can be stretched across a stream of water without loss of current. It withstands a strain of 120 pounds. An apparatus for placing and removing the cable, working automatically, and capable of being attached to a saddle, is employed. Recently in the Punjab, a horseman, proceeding at a gallop, placed the cable over a distance of two miles in seven minutes. To remove it eighteen minutes were required.

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Electrolysis—A Simple Case

By W. L. Williams

THERE are, no doubt, many people who associate the term "Electrolysis" with the forces of destruction and put no other definition upon it. While electrolysis is the direct cause of much destruction, especially to underground cable and kindred systems, its beneficial action is of such great importance and gives birth to such a grand and far-reaching study as electro-chemistry that its destructive action is of little importance compared with its usefulness.

Its influence upon the arts and sciences of civilization is of such great magnitude that it can hardly be overestimated. In fact, it is to electro-chemistry that we owe some of the great discoveries of electricity.

An electric current has no chemical effect while passing through a solid conductor; when the current passes through any liquid conductor other than an elementary substance, such as a melted metal, the liquid is decomposed and chemical action is manifested at one or both electrodes.

In many cases electrolysis is undesirable and would be prevented if practicable, as in the case of damages to underground metal pipes by street railway currents. In order to cause damage to telephone cables by electrolysis a state of moisture must exist.

Electrolysis difficulties in connection with underground cable work is due to the action of stray earth currents, usually due to the ground return of direct current from electric railways—there are practically no electrolysis difficulties with alternating current. It is found that electrolysis occurs at points where a current leaves the cable sheath and enters the ground. At this point oxygen and other chemicals in the earth are liberated which rapidly corrodes the lead sheath.

Frequent tests should be made on all cable systems to determine the polarity of the cable sheaths, with respect to their surroundings.

The tests for this purpose may be made as follows: Two wooden rods about seven feet long should be provided, each having a blunt brass point and connected by a flexible insulated conductor with a portable voltmeter having the scale graduated from .01 to 25 volts. The tests should be made at the manholes, these being the most available points for reaching the cable. One of the brass contact points should then be placed in firm contact with the cable sheath and the other in contact with moist earth by means of thrusting the rod through the drain tile in the bottom of the manhole, and in each case the voltage should be noted, not only in amount but in direction. Readings should also be taken between the cable sheath and the rails of the adjacent electric railway, and to whatever railway return feeders that exist in the immediate vicinity. It is evident that where the cable sheaths are negative to the surroundings no danger will exist, as this would indicate that the current tended to flow from the earth to the sheath. If, however, the cable is found positive to the surrounding earth or traction materials, the matter should be carefully followed up by taking readings in successive manholes, till the danger region has been covered. By this means the maximum danger point can be located, it being, as a rule, the point at which the maximum difference of potential exists. At this point the cable sheath should be securely bonded by a heavy conductor to the return feeders or direct to the negative bus bars of the dynamos of the street railway company's power house. This bond serves to allow the current to flow from the cable sheath through the bond instead of forcing it to flow from the sheath to the earth.

All the cable sheaths entering a manhole should be bonded together; this can generally be accomplished best by bonding the cables by means of strip copper not thinner than .028-inch or narrower than 1.0-inch; this strip should be wiped onto each cable so that the electrical resistance will be practically zero. This assures the fact that all of the cable sheaths will be at an equal potential and that for whatever bonds are run for the protection of one sheath will afford protection for all. It is well to test the cables in each manhole to determine that the cables are at the same potential.

In taking a reading, be sure a complete cycle of changes has occurred on the street railway during the time the reading is being taken, otherwise the reading will not show the conditions to which the cable sheath is subjected, and these must be known before the protection bond can be definitely located. It frequently saves expense to use an aerial cable sheath for the protection bond.

The following steps are necessary before any readings are taken: Locate the street railway power house, plat the street railway rails and return feeders on the underground cable map. Ascertain the voltage at which the outgoing feeders are fed, also the carrying capacity of the incoming feeders, and the maximum and minimum current output. Be sure the trolley work has a positive polarity; in some cases it has been found negative. It is practically impossible to clear out electrolysis troubles when the trolley is negative.

With the above plated on the underground conduit plan, the danger region can be approximately located before any readings are taken, thus saving useless work in the preliminary testing.

After the danger region has been located and a protection bond run, it is necessary that readings be taken at each successive manhole to determine whether or not the cable sheaths are positive at any point. Under no condition should the cable sheaths at any point be positive to ground or traction rails.

In large cities where all underground systems, water and gas mains inclusive, are bonded, clearing out such troubles by means of one bond will be found in most cases impossible, even if there is but one power house in the city.

The rate of injury by electrolysis is proportional to the quantity of the current multiplied by the time, so that one ampere acting for two hours produces the same result as two amperes acting for one hour.

The Spokane & Northern Telegraph Company has issued a general order to all operators along its line to refuse to take a telegram over the telephone for transmission over the wires. Two reasons are given: The telephone will cause mistakes in spelling and pronunciation, and also involves the trouble and expense of keeping books of accounts and making collections.

The new long-distance telephone line between Spokane and St. Joe, Ida., owned by the Interstate Telephone Company, has been opened. The line is 140 miles in length, and built with 30-foot poles and heavy wire.

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Record of a Single Month

PERSONAL.

Ernest Sicafus has been selected as manager of the Mutual Telephone Company at Sullivan, Ill.

C. W. Teed has been appointed manager of the Kinsley Telephone Company at Kinsley, Kas.

John F. May has been appointed manager of the New Home Telephone Company's exchange at Wymore, Neb.

At a called meeting of the Gainsboro Telephone Company, Sparta, Tenn., J. N. Cox was elected general manager.

Geo. Krotter, of Bonesteel, S. D., who has been manager of the Gregory County Interstate Telephone Company, has resigned.

William M. Lawrence has recently accepted the position of manager of the system of the local telephone company at Norwalk, Ohio.

B. G. Snyder, formerly located at Oconto, Wis., has recently accepted the position as manager of the plant of the Antigo Telephone Company.

Roy Wertz, of Sioux Falls, S. D., has assumed the local management of the Johnson County Telephone Company at Iowa City, Iowa, succeeding E. H. Sidwell.

J. S. Haley, prominent in Independent telephone affairs in Montana, visited SOUND WAVES in November. He was in Chicago making purchases of equipment for a complete installation at Bozeman.

A. W. McMackin, for some years past manager of the St. Johns exchange of the New Brunswick Telephone Company, St. Johns, N. B., has been appointed acting general superintendent of the company.

Joseph F. Ogden, who has for several years been manager of the plant of the United Telephone & Telegraph Company at Shamokin, Pa., has been transferred to Uniontown, where he assumes charge of a larger territory.

H. O. Jones, for a number of years with the Stromberg-Carlson Telephone Manufacturing Company, and for the last three years at their Philadelphia office, assumed the management of the Perry Time Stamp Company, Chicago, the first of the month.

Thomas W. Finucane has tendered his resignation as president of the United States Independent Telephone Company, Rochester, N. Y., and as chairman of the company's executive committee. It is understood Mr. Finucane gave no reason for tendering his resignation.

Mr. F. M. Bernardin, president B.-R. Electric Company, Kansas City, Mo., passed through Chicago last week, en route with E. L. Scott, president K. C. Electric & Telephone Supply Company; R. W. Hodge, of the Hodge Electric Manufacturing Company, and W. R. Thomas, of the Columbian Electric Company, St. Joseph, Mo.; Max McGraw, of the Interstate Electric Manufacturing Company, Sioux City, Iowa, and others from the northwest, to attend a meeting of the jobbers' association to be held at Hotel Henley, Pittsburg, Pa. Mr. Bernardin said that the closing of the National Bank of Commerce did not noticeably affect business interests in Kansas City. The confidence in the other banks is shown by increasing daily deposits, and the condition of the National Bank of Commerce was such common talk for a length of time that the closing created no harmful excitement in business. Mr. Thomas' optimistic spirit would not permit any but the best reports from St. Joseph and vicinity.

NEW COMPANIES.

DUKE, Okla.—The Farmers' Union Telephone Company has been incorporated.

McCOOK, Neb.—The Driftwood Valley Telephone Company has been incorporated.

TROY, O.—The Home Telephone Company of Troy has been reorganized and H. H. Allen elected president.

GENEVA, Neb.—The Golden Rod Telephone Company has been incorporated here with J. N. Taylor as president.

ONEKAMA, Mich.—A new rural telephone company will be established at this place with R. F. Wendel as manager.

ENGLEVALE, N. D.—The Englevale-Ft. Ransom Telephone Company has been organized with a capital stock of $10,000.

NEVADA, O.—The Nevada Telephone Company has been formed here with a capital stock of $20,000 by Abe Swartz and others.

HAMILTON, Pa.—The Wallen Panpack Telephone Company, Wayne County, has been incorporated with a capital stock of $10,000.

MODOC, Ind.—The Modoc Telephone Company has been reincorporated and the capital stock increased from $5,000 to $10,000.

TREZEVANT, Tenn.—The Trezevant Telephone Company, recently organized, has elected O. C. Sloan, president; Nevins Arnold, secretary.

PORTLAND, Me.—The Rio de Janeiro Telephone Company has been incorporated here with a capital stock of $1,000,000, by E. C. Eaton and others.

FOREST HILL, Kans.—A telephone company has been organized with W. H. Vermillion as president. The company's lines will connect with Emporia.

BLANDINSVILLE, Ill.—The Industry Rural Telephone Company has been formed and will be incorporated as soon as three hundred subscribers are secured.

MILTON, Wis.—The farmers of Johnstown and Richmond have formed a telephone company with a capital stock of $2,500. G. M. Holbrook is secretary.

WALTON, N. Y.—The People's Telephone Company has been incorporated with a capital stock of $30,000, to operate an Independent telephone exchange.

VERIGIN, Sask.—The Doukhobor Telephone Company has been incorporated for the purpose of building telephone systems in the various Doukhobor villages.

MONTICELLO, Minn.—A new rural telephone company to be known as the Pelican Lake Telephone Company has been organized by the citizens of this city.

FOX LAKE, Minn.—The Fox Lake Rural Telephone Company has been organized with a capital stock of $500, by H. O. Hanson, K. A. Knudson and H. T. Ellingson.

NESHKORO, Wis.—The Neshkoro Telephone Company has been incorporated with a capital stock of $2,000. Incorporators: Charles T. Dahlke and Charles A. Marks.

SHAKOPEE, Minn.—The Carver Telephone Company has been organized by O. C. Bruning, J. J. Farrell, John Hebeisen, John Funk, C. E. Funk, H. D. Meyer and others.

ROULEAU, Sask.—A local telephone system has been installed at this city by the Saskatchewan Telephone Company, of Moosejaw, and other extensions are being planned for.

PORT HURON, Mich.—The Port Huron Citizens' Telephone Company has been incorporated with a capital stock of $10,000 by Chas. Greer, of New Castle, Pa., and others.

SCOTTSVILLE, Ky.—The Bays Fork Telephone Company has been incorporated to construct a new line from Bays Forks to this place. A. Wolch is one of the incorporators.

SHENANDOAH, Pa.—The Farmers' Independent Telephone Company has been organized with $5,000 capital stock. Elmer Dennison, David Davis and others are interested.

WILKINSON, Ind.—The Wilkinson Switch Board & Telephone Company has been incorporated with a capital stock of $500. A. M. Benjamin and Geo. W. Sowerwine are interested.

HARLAN, Ind.—The Harlan Telephone Company has been organized with a capital stock of $25,000. The officers are John H. Zimmerman, president; Frank Dalrymple, secretary.

SHAW LAKE, Wis.—The Bashaw Valley Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are A. E. Allen, J. M. Smith and Eugene Mead.

BOZEMAN, Mont.—The Bozeman Home Telephone Company has been organized at this city, and the work on the construction of an up-to-date telephone plant will be commenced at once.

RICHMOND, Wis.—The Richmond Telephone Company has been incorporated with a capital stock of $2,500, and the incorporators are John D. Clark, Geo. Crumb and Robert Harris.

CADILLAC, Mich.—The Grawn Rural Telephone Company has held a meeting at Monroe Center, Mich., and reorganized under the name of the Grawn Independent Rural Telephone Company.

TOLONA, Ky.—The Tolona Telephone Company has been incorporated to build, equip, and operate a telephone system at this place and other portions of Monroe County. The capital stock is $42,000.

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JONESBORO, Ark.—An Independent telephone company has been organized by the farmers and merchants of Jonesboro, and arrangements have been completed for the starting of a telephone system.

LITTLETON, Ill.—The Littleton and Brooklyn Mutual Telephone Company has been incorporated with a capital stock of $1,000. The incorporators are Herman Yaap, John Crawford and John Day.

TEMPLE, Okla.—The Temple-Randlett-Eschlet Telephone Company has been incorporated with a capital stock of $6,000. The incorporators are: J. W. Adair, V. L. Adair, J. L. Little and H. L. Little.

RED BLUFF, Cal.—Arrangements are being made by R. L. Swanson, owner of the telephone lines from this place to Manton, to organize a farmers telephone system for the people of Antelope Valley.

SHAWNEE, Okla.—Shawnee-Tecumseh Telephone Company has been incorporated with a capital stock of $100,000. Incorporators: J. W. Ruby, H. Alexander, H. Mead, Martin C. Fleming and E. E. Hood.

COTTAGE GROVE, Wis.—The Cottage Grove Telephone Company, Dane County, has been incorporated with a capital stock of $10,000. Incorporators: H. G. Clark, O. M. Donkle, E. C. Alsmeyer and others.

OSKALOOSA, Ia.—An Independent company is being organized at this city and a system is to be installed at once. Among those interested in the new enterprise are George Brown, M. Williams, R. Brown, Louis Perry and others.

HARLAN, Mich.—The Farmers' Telephone Company has been organized at this place. It expects to extend its system to Glengarry, where connections are to be established with the Farmers' Telephone Company of that city.

WARMAN, Sask.—The Warman Telephone Company has been organized, and $3,200 of stock already subscribed. The company expects to expend in the neighborhood of $5,000 upon the installation of a telephone plant in this city.

COLONY, Okla.—The Colony & Carnegie Telephone Company has been incorporated with a capital stock of $1,100. The incorporators are James Suttles, of Colony; C. S. Kern, of Kern; W. T. Matley and Frank Nelson, of Boise.

CHATTANOOGA, Okla.—The Comanche Telephone Company has been incorporated with a capital stock of $5,000. Among those responsible for its formation are T. D. and F. O. Hibbard, of Snyder, and W. S. White, of Mt. Peck.

BURLINGTON, Vt.—Negotiations are under way between the business men of Burlington and M. Buchanan, who operates Independent telephone lines in several counties in the state, for the establishment of a telephone system in this city.

OAKLAND, Cal.—Articles of incorporation have been filed by the Oakland Transcontinental Aerial Telephone & Power Company. The capital stock is $200,000. Albert C. Rockel, W. H. Shadburne, H. F. Dwyer and Albert Jahnke are directors.

PIQUA, Ohio.—The Home Telephone Company has been reorganized. A. H. Strouder, who has been president and possessed considerable stock, sold out and resigned his position. H. M. Allen has taken his place, the other officers remaining the same.

GUTHRIE, Okla.—A charter has been granted the Oakdale Telephone Company to construct a line from Sawn Lake to Binger. The directors and officers are M. Bradstetor, president; Chas. C. Kime, secretary; S. T. Otey, W. A. Thompson and others.

MOORE, Mont.—A rural telephone company is being formed by the farmers living south of Moore. Already twenty-four subscribers have been secured, and the following officers elected: William McConnell, president; W. A. Caldwell, secretary and treasurer.

MARTINSBURG, W. Va.—The White Hall Telephone Company has been organized with a capital stock of $500. The following officers have been elected: L. M. Bender, president; J. N. Eberhart, secretary and treasurer; J. H. Walker, J. A. Dick, H. B. McCormick.

DOUGHERTY, Ia.—Arrangements are being carried on at this city for the organization of an Independent telephone company at Rockwell. D. Cahalan of Mason City and others are taking an active interest in the proposition. An exchange is also to be installed in Dougherty.

LANCASTER, Ky.—The Kentucky Telephone & Telegraph Company of this city has been incorporated. The officers are as follows: H. T. Logan, president; F. B. Marksbury, secretary; J. W. Elmore, treasurer. Directors: Wm. Burnett, W. R. Bastin, H. I. Hamilton and H. V. Bastin.

PEORIA, Ill.—Representatives of the largest Independent telephone companies of northern Illinois are taking steps to organize a toll line company to construct and maintain a copper toll line from Princeton to Peoria. A. O. Cole of the Bureau County Telephone Company is interested.

CEDAR GROVE, N. C.—The Orange Telephone Company has been incorporated with a capital stock of $10,000. Its object is to construct, maintain and operate a telephone system in Granville and adjoining counties, and the incorporators are W. R. Roberts, W. N. Arrowwood and others.

MISSOULA, Mont.—The Bitter Root Telephone Company, of which C. M. Allen is president, T. A. McClain secretary and Samuel McClay treasurer, has been organized at this city. Its plans cover the installation of a telephone system at Missoula, and the construction of lines to Lolo and Carlton.

WOODSTOCK, N. Y.—A considerable part of the capital necessary to build and operate a telephone system has been subscribed by the people of this village. The company to be known as the Citizens Telephone Company has been organized with a capital stock of $24,000, divided into $10 shares.

BROOKLYN, N. Y.—The Inter City Telephone Company has been chartered by the state department to operate lines throughout new and adjacent states. The capital stock is placed at $250,000, divided into shares of $100 each, and the directors are A. W. Linton, T. B. Stevaison, T. H. Dobinson and others.

SOLON, Ia.—The name of the newly organized Independent telephone company at this city is the Morse & Solon Telephone Company, and the following officers have been elected: William Cahill, president; R. Bowman, vice-president; J. L. Adams, secretary; William Andrews, treasurer; A. S. Brown, general manager.

BLACK HAWK, Ind.—The Pierson Mutual Telephone Company has been incorporated to build, equip, and operate a telephone exchange and system in the town of Black Hawk and throughout the western portion of Vigo County. The directors elected are B. F. Beard, H. Tyron, G. C. Smith and S. C. Elliot.

HIGH POINT, N. C.—The Richford Telephone Company, which expects to construct, maintain and operate telephone lines through Davidson, Guilford, Randolph and Forsyth counties, has been organized with a capital stock of $2,000. Among the incorporators are D. M. Hayworth, Jacob Mock, J. B. Payne and others.

HARLAN, Ky.—The Harlan Telephone Company has been organized and expects to construct a telephone line from this city to Hagan, Virginia, a distance of twenty miles. It has an authorized capital stock of $3,000, and the incorporators are Ira Miller, who has been named manager. H. A. Green, D. F. Smith and others.

PRAISE, Ky.—The Marrowbone Telephone Company has been incorporated, and contemplates the construction of a telephone system from Praise, via Hartley and Lookout, to Marrowbone, a distance of about twenty-five miles. The capital stock is placed at $3,000, and among the incorporators are J. B. Polley, Ira Jones, H. C. Yarnell.

SNOW CAMP, N. C.—Articles of incorporation have been filed by the Southern Alamance Telephone Company. Its plans include the construction, maintenance and operation of an up-to-date telephone system. The capital stock is placed at $4,000, of which $1,000 has been subscribed, and the incorporators are N. C. Stuart, E. L. Dixon, John R. Stewart and others.

GREEN FOREST, Ark.—The Farmers' Union, of Carroll county, has organized an Independent Telephone Company, which intends to construct telephone lines in and about Green Forest. It has an authorized capital stock of $3,000, and the following officers have been elected: S. S. Buell, president; E. C. Dooling, vice-president; A. M. Webb, secretary; E. H. Inman, treasurer.

WESTBURY, L. I., N. Y.—On account of the alleged poor service of the New York and New Jersey Telephone Company, it was decided at a recent meeting of the business men of this place to establish a local telephone system for Westbury and Wheatley Hills. The following committee has been appointed to look out for the details of the installation of the system: John A. McKenna, Thomas J. McCord, Frank Powers and S. M. Barlow.

FERGUS FALLS, Minn.—The farmers of the town of Leaf Lake and vicinity have organized a new telephone company to be known as the Ottertail Telephone Company, and will install an extensive telephone system, connecting with the Northwestern system at Henning. Following are the officers: F. H. Ransom, president; George Miller, vice-president; H. H. Brutlag, secretary and treasurer. Directors: Henry Miller and Richard Thalman.

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ELECTION OF OFFICERS.

BRYANTS POND, Me.—The officers of the newly organized Independent telephone company at this city are Elbridge Crooker, president; C. D. Cole, secretary and treasurer.

EAU CLAIRE, Wis.—The Culber Valley Telephone Company has been organized with the following officers: J. J. Culbert, president; A. T. Clark, secretary and treasurer.

LANSDOWNE, Ont.—The officers of the Lansdowne Telephone Company are W. J. Webster, president; C. Fredenburg, vice-president; R. J. Mitchell, secretary, G. F. Dean, treasurer.

COTTAGE GROVE, Ore.—At the annual meeting of the Farmers' & Miners' Telephone Company, A. P. Churchill was elected a director to succeed W. H. Shane, whose term has expired.

LORNA, Ill.—At a recent meeting of the Lorna Mutual Telephone Company, the following officers were elected: John W. Riley, president; S. O. Beals, vice-president; R. G. Hall, secretary; H. C. Wertham, treasurer.

MAYNOOTH, Ont.—The officers of the Peoples Telephone Company, capitalized at $40,000, are: W. J. Sargeant, president; W. J. Fitzgerald, vice-president; Henry Harriett, treasurer; James Harriett, secretary and manager.

SHENANDOAH, Pa.—The Farmers' Independent Telephone & Telegraph Company has elected the following officers: Chas. Laudig, president; B. F. Zimmerman, vice-president; R. W. Faust, secretary; T. W. Rumble, treasurer.

MUSTANG, Okla.—The Mustang Telephone Company has absorbed the Farmers' Mutual Telephone Company, and the following officers have been elected: Frank Dalton, president; F. G. Dennis, vice-president; R. C. Malroy, secretary.

LEWIS, Kans.—At a meeting of the stockholders of the Edwards County Mutual Telephone Company, the following officers were elected: J. W. Bridges, president; David Gibson, vice-president; D. C. Miller, secretary; C. E. Sturdevant, treasurer.

HOPKINSVILLE, Ky.—At the annual meeting of the Hopkinsville Telephone Company held recently, the following officers were elected: R. E. Cooper, president; W. T. Fowler, vice-president; J. W. Garnett, treasurer, and J. T. Edmunds, general manager.

TRENTON, N. J.—At the annual meeting of the Interstate Telephone Company, the following officers were elected: H. R. Swartz, president; Wm. S. Hancock, vice-president; Barker Gummore, secretary; C. W. Wrght, treasurer, and F. A. Demarest, general superintendent.

PANA, Ill.—The following officers and directors have been elected by the Christian County Telephone Company: Warren Penwell, president; Lee D. Hewitt, vice-president; Frank Brewer, secretary; C. M. Parker, treasurer; directors, G. W. Milligan, Warren Penwell, J. M. Kuhn and D. W. Johnson.

DRUMBO, Ont.—The Princeton & Drumbo Telephone Company, recently incorporated, has elected the following officers: F. J. Daniel, president; T. Conroy, vice-president; G. S. Smith, secretary; W. H. Wells, treasurer. The company proposes to operate in the following villages: Princeton, Drumbo, Eastwood, Gobles, and possibly Cathcart and Paris.

CENTERVILLE, Ind.—The following board of directors has been named by the Centerville Co-operative Telephone Company: Isaac Sphar, John B. Pierce, Edward Hildebrand, Frank Clevenger, David Hanigan and others. The officers are as follows: M. A. Stevens, president; J. B. Pierce, vice-president; H. H. Poelle, secretary; Thomas J. Clevenger, treasurer.

NEW CONSTRUCTION AND EXTENSIONS.

VIELE, Ia.—The Viele Independent Telephone Company will construct new lines.

EMDEN, Ill.—The Bethel Telephone Company is planning to rebuild its system at Emden.

FRANKFORT, Mich.—The Benzie County Telephone Company will build a line to Goodrich.

ABBYSVILLE, Kans.—The People's Telephone Company will enlarge its plant in Abbyville.

HAVENVILLE, Kans.—The Independent Telephone Company will extend its lines to Avoca.

HAMBURG, Mo.—J. S. Athen and others will erect a telephone line from Hamburg to Watson.

HASTINGS, Ont.—The lines of the Hastings Telephone Company will be extended to Roslin.

PLATTE, S. D.—The Torrey Lake Telephone Company will put in a rural telephone system.

LAWRENCE, Kan.—The lines of the Home Telephone Company in this city will be extended.

INGRAM, Wis.—The Chippewa Valley Telephone Company will install an exchange at this place.

RICHMOND, Ind.—The Home Telephone Company is making a number of improvements in its system.

CHAMPAIGN, Ill.—The lines of the Home Telephone Company will be entirely rebuilt in Champaign.

BARRON, Wis.—The lines of the Hinesdale & Western Telephone Company will be extended to this city.

GOSHEN, Ind.—The Goshen Home Telephone Company will expend about $25,000 in improving its system.

CLARESHOLM, Alta.—The Prairie Farmers' Telephone Company will extend its lines into the Star district.

SANFORD, N. C.—The Sanford-Jonesboro Telephone Company will greatly extend its lines in Lee county.

DELTON, Wis.—A telephone line between Delton and Kilbourn will be erected by Reynolds and Lambert.

HARMON, Ill.—Among the extensions planned by the Green River Telephone Company is a line to Clatworthy.

BERKELEY, Cal.—The Home Telephone Company will build an exchange building at this place costing $40,000.

AUDUBON, Minn.—The Audubon Telephone Company will construct a new farmers' telephone line to Pearl Lake.

ALLENTOWN, Pa.—The Consolidated Telephone Company, of this city, will extend its lines throughout Lynn county.

AMARILLO, Tex.—A new line from Davenport to Amarillo will be erected by the Davenport Telephone Company.

NEW LONDON, Wis.—The Matteson Telephone Company will make many improvements in its exchange at this place.

ALLENTON, Wis.—Many improvements and extensions in its plant are being made by the Allenton Telephone Company.

DIKE, Iowa.—The Corn Belt Telephone Exchange Company contemplates making improvements in the local exchange.

DETROIT, Mich.—The Nichols-Chisholm Lumber Company will build a telephone line from Frazee to its head camp.

SIOUX CITY, Ia.—The Sioux City Telephone Company will expend $20,000 in the improvement of its automatic system.

LINDSAY, Ont.—Work on its conduit system in this city is soon to be commenced by the Automatic Telephone Company.

SANTA FE, N. M.—A telephone line from Santa Fe on the Pecos River is to be constructed by the Bureau of Forestry.

MONTELLO, Wis.—Among the new lines to be built by the Shields Telephone Company is one from Montello to Budsin.

MOLINE, Ill.—Union Electric Telephone & Telegraph Company will place its wires underground in the business districts.

BRAZIL, N. D.—The Brazil Telephone Company will build an up-to-date telephone plant at Rugby with underground wires.

ROLLA, Mo.—N. A. Kinney, manager of the Rolla Telephone Company, states that his company will install a new switchboard.

MINNEAPOLIS, Minn.—All telephone wires in the business portion of the city of Minneapolis are to be placed underground.

ENDERS, Pa.—The Enterline-Halifax Telephone Company has decided to build a line through Small Valley in the near future.

SAN FRANCISCO, Cal.—Application has been made by the Home Telephone Company for permission to lay additional conduits.

STERLING, Ill.—The Inter State Telephone Company is constructing new lines from here to Morrison, Coleta and Prophetstown.

HENDERSON, Minn.—The Henderson Telephone Company will greatly extend its lines and improve its system in many other ways.

HAVANA, Ill.—Among the improvements planned by the Citizens' Telephone Company is the installation of a new toll board.

MARENGO, Ia.—It is estimated that about $2,000 will be spent by the Marengo Telephone Company in the improvement of its system.

PRINCETON, Ind.—Many improvements and extensions in its plant are being planned by the Princeton Telephone Company at this city.

IOWA CITY, Ia.—The Johnson County Telephone Company will construct a new copper metallic circuit between here and Riverside.

SALEM, Mich.—The Home Telephone Company is rebuilding its old lines in West Salem and will also construct a number of new lines.

MANKATO, Minn.—The Mankato Citizens' Telephone Company contemplates the erection of a new line between Mankato and Hebron.

Storm Lake, Iowa.—The Northern Telephone Company contemplates making improvements in its local exchange to cost about $1,500.

Havelock, Ont.—A petition has been granted to the Havelock Electric Light & Power Company to install a local telephone system.

Oakham, Mass.—A new line throughout the southern portion of Oakham will be erected by the Parker & Conant Telephone Company.

Kalamazoo, Mich.—The Kalamazoo Home Telephone Company will place its wires underground all over the business section of the city.

Payette, Idaho.—To take care to its increasing business a new switchboard is bing installed by the Independent Telephone Company.

La Belle, Mo.—Considerable cable is to be put up by the La Belle Telephone Company is making the improvements that have been planned.

Winnipeg, Man.—A telephone line 74 miles in length from Winnipeg to the Point Bois power plant will be erected at once by the government.

Dougherty, Iowa.—The Rockwell Farmers' Telephone Company is contemplating the establishment of a local and rural telephone exchange.

Clinton, Wis.—The Clinton Telephone Company contemplates the installation of a new switchboard and a number of other improvements.

Benson, Ariz.—A telephone system has been installed by the Boquillas Land & Cattle Company from Boquillas to St. David and Fairbank.

Grand Rapids, Mich.—Application for permission to build additional lines in Grand Rapids has been filed by the Citizens' Telephone Company.

Hampton, Iowa.—The Central Iowa Telephone Company, headquarters Iowa Falls, contemplates the entire rebuilding of its plant at Hampton.

Myton, Utah.—Connections between the Eastern Utah Telephone Company and the Vernal Telephone Company have been established at Myton.

Aylmer, Ont.—The Rural Telephone Company, of East Elgin, which has a central exchange at Aylmer, is extending its lines in many directions.

Bright, Ont.—The Innerkin Rural Telephone Association, which has already installed a number of telephones, expects to greatly enlarge its plant.

Frazee, Minn.—A telephone line from Frazee, by way of the Otter Tail river, to Grand Park, will be built by the Nichols-Chrisholm Lumber Company.

Salt Lake City, Utah.—The Nevada Telephone Company hopes to establish communication between Salt Lake and Wells, Elko and Tuscarora very soon.

Bristol, Tenn.—Among the many improvements planned by the Bristol Telephone Company is the reconstruction of its lines between this city and Blountville.

Flint, Mich.—The City Council of Flint has instructed the Valley Telephone Company to place all its wires underground in the business portion of Flint.

Youngstown, Ohio.—It is the intention of the Youngstown Telephone Company to erect a line from Ellsworth to Canfield, and to otherwise enlarge its plant.

Ft. Pierre, S. D.—The Homestead Telephone Company, which is building from this city to Hayes, will continue the line on from the latter place to Leslie.

Austin, Minn.—The Tri-State Telephone Company is making an effort to enter Rochester, Minn., with its lines and connect with the local exchange there.

Luverne, Minn.—A new switchboard has been installed by the Luverne Telephone Company, and many additional improvements in its plant are contemplated.

Hindman, Ky.—The Carrs Fork Telephone Company is planning for the erection of a twenty-five mile extension from Hindman, via Lackey, Ky.

Silverton, Colo.—Permission to construct a telephone line seven miles long in the Montezuma forest has been granted to the Gold Mines & Power Company.

Mullen, Neb.—A telephone line north of Mullen is to be constructed by J. L. Rosenberry, who has already built other rural lines in the vicinity of that city.

New Castle, Pa.—The Union Telephone Company, which is renewing and improving its entire plant in this city, has applied for additional conduit privileges.

Honey Creek, Wis.—Among the extensions planned by the Eagle Telephone Company is the erection of a new line to the German settlement west of Honey Creek.

Paxton, Ill.—The Paxton Telephone & Telegraph Company, which has already expended about $6,000 in improving its system, is considering other extensions.

Amaranth Station, Ont.—The Amaranth Telephone Co-Operative Telephone Association, of which Stewart Tate is secretary, contemplates the extension of its lines.

Appleton, Wis.—Plans have been prepared by W. W. De Long, architect, for a new telephone exchange building for the Fox River Valley Telephone Company to cost $10,000.

Seminary, Miss.—The People's Telephone Company has just completed the local telephone system and contemplates extending its lines to Hattiesburg, Collins and Mt. Olive.

Audubon, Iowa.—The lines of the Audubon County Telephone Company between Audubon and Exira will be rebuilt, and the company is planning other improvements at Audubon.

Joplin, Mo.—The Home Telephone Company is planning for connections with Pierce City, Monett and Aurora, which will greatly improve the toll service for its local subscribers.

Pembroke, Maine.—The Forest Telephone Company will erect a metallic circuit between Pembroke and Dennysville to form part of a trunk line between the latter town and Calais.

St. Albans, Vt.—The Orange County Telephone Company has begun the work of building a trunk line from Randolph to Northfield. A metallic system is to be installed next spring.

Kaukauna, Wis.—The Fox River Valley Telephone Company will build an exchange at this place next summer, which will make the service complete from Green Bay to Appleton.

Charleston, W. Va.—The Charleston Home Telephone Company, which already has 2,500 telephones in service in this city, contemplates the installation of 1,500 additional telephones.

San Angelo, Tex.—Messrs. Midkiff & Bennet have bought 50 miles of telephone lines from the Sheffield Telephone Company, and propose to build a new line from Adams to Sheffield.

Lansdowne, Ont.—The Lansdowne Telephone Company, which operates in the counties of Leeds and Grenville, is considering the advisability of extending its lines in many directions.

Azalia, Ind.—The Azalia Telephone Company, which connects with the Citizens' Telephone Company at Columbus, contemplates making many improvements and extensions in its system.

Seminole, Texas.—The lines of the Seminole Telephone Company will be extended from this city to Plains, the county seat of Yoakum county, and other extensions are being considered.

Peoria, Ill.—The Rock Island railway system will install a private telephone exchange on the Rock Island property. The exchange will be composed of four trunk lines extending to 15 stations.

Onekama, Mich.—The Onekama Telephone Company, of which R. F. Wendel is manager, is making negotiations for the Bear Lake territory and plans to establish a rural exchange at Bear Lake.

Washington, Iowa.—The Washington Telephone Company will rebuild its system at this city, and expects, when the work is finished, to have a plant which will be up-to-date in every particular.

Wheeling, W. Va.—The National Telephone Company will make application to the county courts for permission to place its wire underground along the county road through the Narrows to Glendale.

Salina, Kans.—To accommodate its rapidly growing business in Solomon, the Salina Telephone Company will install a new switchboard. Other improvements in its system are also contemplated.

Vienna, S. D.—Arrangements are being made for the construction of an Independent telephone line southwest of Vienna, which is to be connected with the Dakota Central Company's lines at that place.

Beeville, Tex.—The Eureka Telephone Company, which has recently increased the capacity of its exchange at this city, intends to completely overhaul its plant and make it up-to-date in every particular.

Raleigh, N. C.—The installation of a new switchboard and the stringing of a considerable amount of additional cable are among the improvements being undertaken by the Hickory Telephone Company.

Colson, Ky.—A seven-mile telephone line from Colson to Ison is to be constructed by J. M. Brown, whose intention is to

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form connections to the latter city with the Rockhouse Telephone Company.

MARQUETTE, Mich.—The Marquette County Telephone Company, which has already installed a new switchboard in this city and made many other improvements, expects to follow a similar course in Ishpeming.

PALO, Mich.—The Palo Telephone Company has secured a sufficient number of subscribers at Hubbardston to warrant it in establishing an exchange at that place, and work on it has already been commenced.

CROWN POINT, Ind.—To take care of its rapidly increasing business in this city, the Crown Point Telephone Company expects to install a new switchboard and to make many other improvements in its plant.

BELLEFONTAINE, Ohio.—The United Telephone Company will install additional equipment, which will double the capacity of the farm board and greatly increase the efficiency of the service for the rural subscribers.

PARKERSBURG, W. Va.—The West Virginia Western Telephone Company expects to build a direct circuit between Charleston and Parkersburg at an early date. Connections are to be established with Pittsburg.

TOMBSTONE, Ariz.—The Adams Telephone & Telegraph Company, which was recently formed, will build a telephone line from Wilcox to Bowie and west from Wilcox via Fort Grant and Bonita to the Klondike.

RANDOLPH, Vt.—Work on the construction of a trunk line betwen Randolph and Northfield has been commenced by the Orange County Telephone Company, which expects to eventually install an entire metallic system.

CARBONDALE, Colo.—Acting Supervisor John MacLaren, on the Holy Cross national forest in Colorado, has been authorized to expend $2,200 for the construction of a telephone line from Carbondale to Norrie, by way of Basalt.

TRUXTON, N. Y.—Among the improvements being considered by the Truxton & Chenango Telephone Company is the rebuilding of its lines and the construction of a line to take care of the new subscribers it has recently secured.

EAST SPRINGFIELD, N. Y.—The East Springfield Independent Telephone Company is completing its exchange in Sharon Springs, and will extend its toll lines to Canajoharie, connecting with the United Message Company's lines.

DALLAS, S. D.—It is the intention of the Gregory County Interstate Telephone Company to install a local telephone exchange at this city. A sufficient number of subscribers have been obtained to justify the company in making this move.

SPOKANE, Wash.—The Interstate Telephone Company will extend its line to Wallace. It is expected to complete the line as far as Cataldo, which is within twenty-five miles of Wallace, this fall, and complete the work to Wallace early in the spring.

HAVENSVILLE, Kas.—The Independent Telephone Company's improvements include the rebuilding of a number of its lines. It is also constructing a line from Havensville to Avoca, and expects to make its system thoroughly modern in every particular.

PORTLAND, Tenn.—The Sumner County Home Telephone Company, which is installing a telephone system in Gallatin, will establish an exchange at Portland. Connections are to be made with Westmoreland through Bethpage, and many other extensions are contemplated.

BUTTE, Mont.—The county commissioners have granted the petition of the Independent Telephone Company to place telephone poles along the country roads. The company will install an exchange at Cementville, in the Missouri valley, a short distance below Three Forks.

SALEM, Ohio.—The directors of the Unity Township Telephone Company met at Columbiana recently and arranged an agreement whereby service will be extended into the southeastern portion of Mahoning county, which will necessitate the building of new lines into that field.

CLAY CENTER, Kan.—Among the improvements planned by the Clay Center Telephone Company is the installation of a modern new multiple switchboard, a new toll board, new office equipment, the cabling of the business part of the city, and the changing of the entire plant to metallic.

GREAT FALLS, Mont.—The Independent Telephone Company of Butte is planning to establish an exchange in Great Falls during the coming winter. Its exchange at Anaconda is practically completed, and it is expected the systems at Helena and Great Falls will be installed at the same time.

ROCKFORD, Ill.—The Home Telephone Company of this city is planning to double its present capacity. New cables are to be strung in every part of the city, and the system improved in every possible way. These extensions have been very necessary on account of the increase in the company's business.

MUSCATINE, Iowa.—Superintendent William Miller, of the Misissippi Valley Telephone Company, has signed a contract whereby his company obligates itself to construct a cable across the Mississippi river and build a line from the Illinois end of the bridge to the eastern terminus of the Drury toll road.

HUMBOLDT, Iowa.—Owing to its rapidly increasing business, the Rural Union Telephone Company has decided to install a new switchboard at this city. Many other improvements in its system are contemplated, and it is expected that a strictly up-to-date plant in all particulars will be in operation in the near future.

GALESBURG, Ill.—The Galesburg Union Telephone Company contemplates the establishment of toll connections with the Inter State Telephone Company. By these arrangements it will be enabled to put its subscribers in communication with Kansas City, St. Louis, a large part of the state of Missouri, Peoria, Springfield, and other leading Illinois cities.

ROCKY MOUNT, Va.—The Franklin County Telephone Company, by means of its recently constructed lines, is able to communicate with Gogginsville, Wertz, Alean and Taylor's Store in fact, connections have practically ben established with the entire northeastern part of the county. Other extensions and improvements are contemplated in the near future.

SOUTH PITTSBURG, Tenn.—The East Tennessee Telephone Company is planning many changes and improvements for the local exchange. A new switchboard will be installed and other improvements, calculated to make the exchange more efficient and up-to-date, will be made. Extensions will be made in several suburban lines and a number of new lines will be run to Depford.

PRINCETON, Ill.—Plans are under way for the formation of a new toll line company, whose purpose is to construct a toll line between Princeton and Peoria. Those interested are O. A. Cole, of the Bureau County Telephone Company; F. M. Ashe, of the Kewanee Independent Telephone Company; E. R. Conklin, of the Interstate Telephone Company. The company is to be called the Shield Long Distance Telephone Company and is to be incorporated with a capital stock of $25,000.

TRANSFERS AND FRANCHISES.

WITTENBURG, Wis.—John Eckhoff recently bought the Manawa telephone exchange from U. S. Briggs.

LAKE GENEVA, Wis.—H. E. Miles and H. Holston have bought the Milton Junction telephone system.

KINGWOOD, W. Va.—The Fairmont Telephone Company will buy out the Morgantown and Kingwood Company.

WAUNAKEE, Wis.—The Waunakee Telephone Company has been purchased by J. C. Neill and Robert Chambers.

NORTH MANCHESTER, Ind.—The North Manchester Telephone Company has purchased the Eel River Telephone Company.

EDGELEY, N. D.—The Pomona Valley Telephone Company has been granted a franchise to erect a telephone line to Streeter.

FLINT, Mich.—J. W. Martin has been granted a franchise at this place. Work on the new system will be commenced at once.

MAROA, Ill.—N. A. Watts of this city has bought out the telephone system at Cabery, Ill., and will take up his residence there.

EGERTON, Wis.—W. C. Oviatt has sold the Milton Junction Telephone Company to H. P. Mills of Milton and E. N. Holston of Walworth.

PLEASANTVILLE, Ia.—The citizens have voted to grant the Swan Telephone Company a franchise to erect and maintain a telephone system.

WAGONER, I. T.—J. H. Schwaim of Osage City, Kans., who recently bought the local telephone system, has been granted a franchise at this place.

STAR, Mo.—The officers of the Star Telephone Company are negotiating for the purchase of the Bell telephone lines in the village of Upper Alton.

SEYMOUR, Ind.—The Seymour city council granted a twenty-year telephone franchise to the Citizens' Mutual Telephone Company, a local corporation.

PLEASANTVILLE, Ia.—An application for permission to operate a telephone exchange in this town has been made by the Swan Telephone Company.

SPRINGFIELD, Mo.—Slayton Cavin, of this city, has purchased the Humansville Telephone Company's exchange and lines; the consideration being $15,000.

WONEWOC, Wis.—The telephone exchange at Wonewoc has

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been acquired by H. D. Wolfe of Charlotte, Mich., who expects to make many improvements.

Toppenish, Wash.—The Yakima Valley Telephone Company has been granted a telephone franchise by the city council and will shortly install an exchange.

Lucedale, Miss.—The Leaksville & Merrill Telephone Company, recently granted a franchise, will commence the installation of its system as soon as possible.

Glasgow, Ky.—Travis Taylor, representing the Home Telephone Company, has purchased the newly created telephone franchise at this place, paying $50,000 for it.

Lackney, Ky.—A franchise to construct and operate a telephone line along any public road in Floyd county has been granted to the Lackney Telephone Company.

Kankakee, Ill.—The Kankakee Independent Telephone Company has been granted a franchise in Momence. A new and modern exchange will be installed at Momence.

Toronto, Ont.—The Temiskaming and Northern Ontario Railroad, with head offices at Toronto, is negotiating for the system of the Temiskaming Telephone Company at Cobalt.

Marshall, Mo.—S. B. Newton and others of this city, representing the Saline County Telephone Company, have submitted a proposition to the city council for a telephone franchise.

Woonsocket, S. D.—The system of the Woonsocket Telephone Company has been acquired by O. Schuler and Guy McCurdy of Lane, who expect to greatly improve the service.

Milan, Minn.—The Citizens' Telephone Company of Montevideo offer its Watson exchange for sale. The probabilities are that a local company will be formed to purchase the property.

Wheeling, W. Va.—John A. Howard, president of the National Telephone Company, has secured possession of the holdings of the C. B. Graham and C. J. Heinlein in the Belmont Telephone Company.

Sioux Falls, S. D.—Fred Harris of this city has purchased the controlling interests in the Hartford Electric Light and Telephone Company at Hartford, S. D. Modern improvements are to be made in the system.

Pontiac, Ill.—The Livingston County Home Telephone Company has surrendered its charter. The construction of the system will be taken up and finished by Mr. Vernier of Kankakee and Mr. Branson of Ohio.

Steubenville, Ohio.—The county commissioners have granted the Knoxville Rural Telephone Company a franchise for a right-of-way between Knoxville and Osage, by the way of Toronto, Empire and Somerset pikes.

Toluca, Mex.—Juan Ochoa Ramos has purchased the long distance telephone line from Toluca to the City of Mexico. He will thoroughly overhaul the system. A metallic circuit will be installed over the entire line.

Springfield, Mo.—The county court granted the Willow Springs Local and Long Distance Telephone Company a franchise to build a telephone line on the Rock Bridge road from the east county line to Springfield.

Tonopah, Nev.—The Nevada Consolidated Telephone & Telegraph Company has purchased all the rights, plant and equipment of the Pacific States Telephone & Telegraph Company in this city and immediately assumed possession.

Augusta, Me.—The Northeastern Telephone Company, which has obtained a franchise in Augusta, and expects to eventually establish a system there, contemplates the expenditure of several thousand dollars in improving the service in Phillips, Farmington, Rangley and other places.

Heber City, Utah.—The Uintah Telephone Company and the United States Forest Service were each granted a franchise by the board of county commissioners to construct and operate telephone lines, the former anywhere in the county, and the latter between Heber and Stockmore.

Odon, Ind.—The Odon Telephone plant, formerly the property of W. L. Stoy, G. Abraham, W. W. Morrison and others, has passed into the hands of William Adgis, of La Fayette, the consideration being $20,000. Improvements in the system are to be made under the new management.

Huron, S. D.—Application for the renewal of its franchise for ten years has been made in this city by the Dakota Central Telephone Company. If it is granted the company promises to erect a building, to be used as headquarters and a central station and to install an automatic system.

Garretson, S. D.—The South Dakota Rural Telephone Company has changed its main office from Sherman to Garretson. The officers of the company are Emil Benson, president; J. N. Nelson, vice-president; Theo. Holien, secretary and treasurer. Mr. Holien will take charge of the exchange.

Sheffield, Tex.—The fifty miles of telephone line formerly owned by the Sheffield Telephone Company has passed into the possession of Messrs. Midkiff and Bennett, the purchase price being $1,750. The new owners expect to build a line from Sheffield to Adams and later on to Fort Stockton.

Marion, O.—A new corporation, headed by H. D. Critchfield of Milwaukee, Wis., has applied to the city council for a 25-year franchise to install a telephone system in this city and county. The Bell and Marion County Telephone were recently merged. The new company will be capitalized at $250,000.

Jamestown, N. Y.—The United States Independent Telegraph Company has sold its holding in the Home Telephone Company, of Jamestown, to a group of Jamestown capitalists, represented by Arthur C. Wade. The company will be reorganized at once, the management to be purely local in every respect.

Flint, Mich.—Joseph W. Martin, of Detroit, is backing a new telephone company, which is seeking to gain foothold in this city. It is understood it contemplates a working arrangement with the Valley company and the rural telephone exchanges throughout the county, in opposition to the Michigan State Telephone Company.

Pikeville, Ky.—The Eastern Kentucky Home Telephone Company, of which O. N. Starkey is manager, has been granted a franchise to build its lines anywhere in Pike county. It has just completed a twenty-five-mile extension to Williamson, W. Va., and expects to commence the construction of a line to Praise, Ky., at once.

LeBeau, S. D.—The Potter County Telephone Company, of which J. H. Hollingsworth is superintendent, has secured a franchise to enter this city, and construction on its system will be commenced as soon as possible. The company has already secured a number of subscribers in LeBeau, and will also build a line between Lowry and Alaska.

Los Angeles, Cal.—The Union Home Telephone Company, controlling the Independent systems of ten southern California cities, has made public an arrangement whereby its interests have been combined with those of the United States Long Distance Telephone Company. J. M. C. Marble, president of the Union Home Telephone Company, has resigned, and Frank W. Wachter has assumed the management of both corporations.

Augusta, Me.—The Northeastern Telephone Company, which is to be taken over by strong financial interests in Maine, in which the city of Augusta is to be largely represented, expects to apply to the city council for permission to erect lines in that city. Herbert Wilcox, who is active in the work of reorganization, states that a system is to be installed, if the franchise is granted, which is to be operated in connection with one extending from Lewiston through Monmouth, Hallowell and Gardiner.

FINANCIAL.

Adrian, Mich.—The Schwarze Electric Company has increased its capital stock from $25,000 to $40,000.

Bergholz, Ohio.—The Bergholz Telephone Company has increased its capital stock from $20,000 to $40,000.

Lupton, Mich.—The capital stock of the Ogemaw Telephone Company has been increased from $2,500 to $5,000.

Ottawa, Ill.—The Ottawa Home Telephone Company has decreased its capital stock from $150,000 to $60,000.

North Parma, Mich.—The North Parma Telephone Company has increased its capital stock from $5,000 to $10,000.

Pesotum, Ill.—At a recent meeting of the Pesotum Mutual Telephone Company, a dividend of 15 per cent was declared.

Black Hawk, Ind.—The Pierson Mutual Telephone Company, Vigo county, has been organized with a capital stock of $2,000.

Sergent, Ky.—The capital stock of the Letcher County Home Telephone Company, recently incorporated, has been increased from $2,000 to $5,000.

Rochester, N. Y.—The Rochester Telephone Company will make over $100,000 net profits this year, while Utica, also in the U. S. I. System, will do better than $25,000.

Sergent, Ky.—The Sergent-Ola Telephone Company has recently increased its capital stock $500 and expects to commence the construction work on a line to Hilliard at once.

Jackson, Miss.—The Oxford Telephone Company reports to the railroad commission that its total receipts for the quarter recently ended were $1,049.25; expenses, $756.45; net revenue, $292.32.

KELLOGG SWITCHBOARD AND SUPPLY COMPANY
CHICAGO

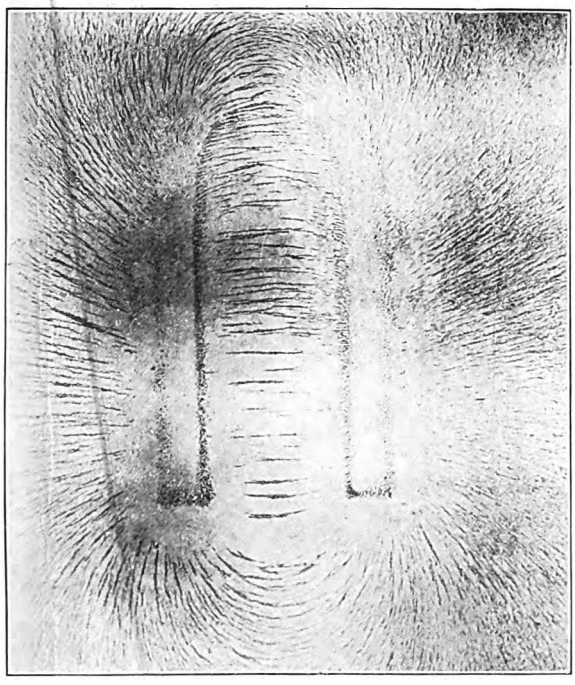

Fig. 17.

We have several times recently called attention to the absolute magnetic measurements of the steel used by the Kellogg Company for magnets. By knowing and using the very best of magnet steel, we gain in the increased amount of magnetism. If, however, these magnetic lines do not pass through the ARMATURE they are of no use, and the output of a generator suffers.

It is a known fact that by shunting a resistance in an electrical circuit with a circuit of zero resistance, all the current will pass through this zero resistance circuit. Likewise, if a magnetic circuit be shunted with a circuit of zero reluctance, all the lines of force will pass through this zero reluctance circuit.

Therefore, if a "keeper" having zero reluctance is placed across the poles of a horseshoe magnet, all the magnetic lines of the magnet will pass through the keeper.

In generator construction instead of a "keeper" the armature is used through which the lines travel.

Figure 17 shows the direction of the magnetic field around a horseshoe magnet without a "keeper."

Figure 18 shows the direction of the field as actually existing around the Kellogg generator when the armature is in place.

It will be noted that by using a low reluctance armature circuit, the leak lines at the bend in Figure 17 are made to disappear in Figure 18.

The only way to gain this is by having a minimum air gap and good iron in the armature.

Kellogg fields are bored and reamed to size and the armature is turned to size. This insures absolutely the smallest possible air gap. There are no steel shafts nor steel laminations made hard by punching in the Kellogg armature.

Careful magnetic tests have proven beyond all possible doubt that the iron and steel used in Kellogg generators is the best.

Having developed the hidden qualities of the generator to its high state of perfection the mechanical features easily speak for themselves. What is most desired is permanency, smooth operation, high efficiency and great output in the beginning as well as years from now. In other words, LASTING QUALITIES. This means a Kellogg.

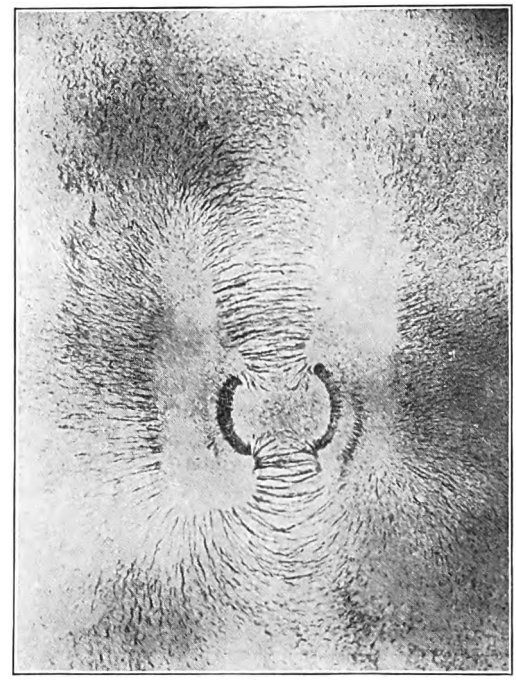

Fig. 18.

BRANCHES

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ELECTRIC BLDG.

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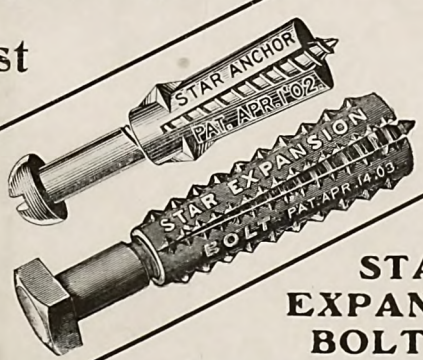

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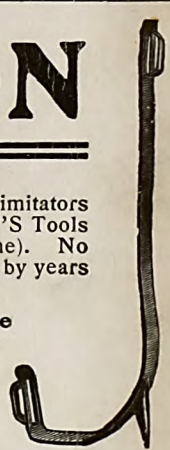
Trask and Humphrey sts., Bayonne, N. J.

CAUTION



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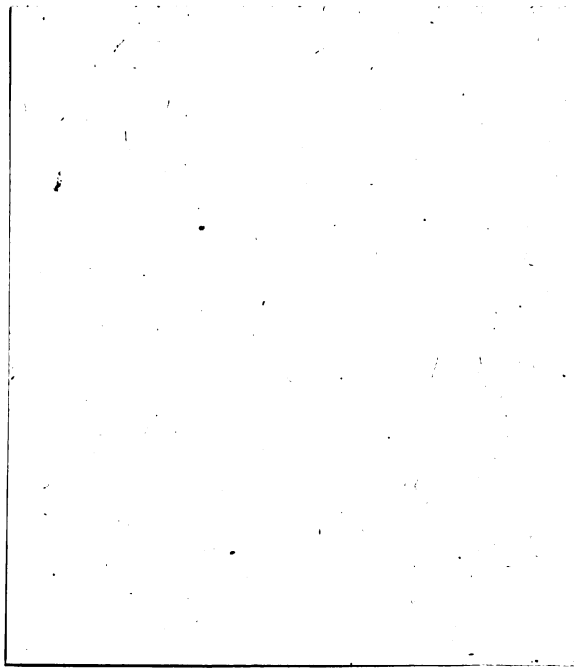

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